



# Estimates of harvest for duck and quail in Victoria

**Results from surveys of Victorian Game Licence holders in 2015**

# Acknowledgements

This report is based on the Unpublished Client Report produced by the: Arthur Rylah Institute for Environmental Research Department of Environment, Land, Water and Planning, PO Box 137, Heidelberg, Victoria 3084. Phone (03) 9450 8600

*Estimates of harvest for duck and quail in Victoria: results from surveys of Victorian game Licence holders in 2015.*

Paul D. Moloney and John D. Turnbull

© State of Victoria, Game Management Authority 2016

This publication is copyright. Apart from fair dealing for the purposes of private study, research, criticism or review as permitted under the *Copyright Act 1968*, no part may be reproduced, copied, transmitted in any form or by any means (electronic, mechanical or graphic) without the prior written permission of the State of Victoria, Game Management Authority (GMA). All requests and enquiries should be directed to the Customer Service Centre, 136 186 or email [customer.service@delwp.vic.gov.au](mailto:customer.service@delwp.vic.gov.au)

ISBN 978-1-925466-51-5 (Print)

ISBN 978-1-925466-52-2 (PDF/online)

**Disclaimer:** This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

**Front cover photo:** Lake Bael Bael near Kerang (GMA Image Library).

# Contents

<b>Summary .....</b>	<b>4</b>
<b>1 Introduction.....</b>	<b>5</b>
<b>2 Methods.....</b>	<b>6</b>
General methodology .....	6
Duck.....	6
Quail.....	6
<b>3 Results .....</b>	<b>7</b>
Duck.....	7
Quail.....	12
<b>4 Discussion .....</b>	<b>16</b>
Duck.....	16
Quail.....	18
Locations with the most hunting days.....	19
Assumptions.....	19
<b>References.....</b>	<b>20</b>
<b>Appendix 1.....</b>	<b>21</b>
<b>Appendix 2.....</b>	<b>23</b>
<b>Appendix 3.....</b>	<b>24</b>

## Summary

Between March and July 2015, during the hunting seasons for duck and quail, telephone surveys of Victorian hunters were conducted to estimate the total harvest for each game type. Game Licence holders for each game type were randomly sampled and interviewed by telephone at intervals during their respective game seasons. In all surveys, respondents were asked whether they had hunted or not during the period for which the survey applied and (if applicable) the number and species of animals harvested. Additional information was obtained on hunting methods and locations.

Each holder of a Game Licence for ducks hunted on approximately 3.6 days during the 2015 duck hunting season, with an average season harvest of 11.4 ducks per Game Licence holder. Based on the total number of Game Licence holders, this equates to an estimated 286,729 ducks harvested during the 2015 duck hunting season in Victoria (95% confidence interval [CI] = 249,645–329,322). The three most commonly harvested species were Pacific Black Duck (which comprised 29% of the total harvest), Australian Wood Duck (28%) and Grey Teal (28%). The remaining ducks harvested were Chestnut Teal (7%), Pink-eared Duck (6%), Mountain Duck (2%), Blue-winged Shoveler (1%) and Hardhead (<1%).

Each holder of a Game Licence for quail hunted on approximately 0.8 days during the 2015 quail hunting season, with an average season harvest of 3.6 quail per Game Licence holder. Based on the total number of Game Licence holders, this equates to an estimated 101,244 quail harvested during the 2015 quail hunting season in Victoria (95%CI = 68,761–149,074).

The total number of hunter days during the 2015 hunting season for ducks and quail was estimated to be 129,169 (95%CI = 96,962–129,169).

The approach used here explicitly accounts for the possibility that not every holder of a Game Licence will hunt during every survey period. The total number of Game Licence holders who hunted was estimated for each survey period and combined with the harvest per hunter to derive the total harvest for each survey period.

The methodology of performing telephone surveys throughout the season is likely to minimise memory bias and non-response bias compared with the previous end-of-year postal surveys. However, sources of bias will remain (due to over- and under-reporting), and the estimates of total harvest must be interpreted with care.

*Note: Numbers within the text have been rounded.*

# 1. Introduction

To effectively manage game species, it is important to quantify the numbers harvested. Since 2009, the State Government and its game management agencies have commissioned a series of regular telephone surveys of randomly selected Game Licence holders. Three sets of telephone surveys were conducted during the various game harvest seasons for deer, duck and quail. However, this report focuses only on the duck and quail harvests. Deer harvesting results will be reported on separately.

The 2015 duck hunting season lasted 12 weeks, from 21 March to 8 June (Game Management Authority 2015). Eight species could legally be hunted in 2015: Pacific Black Duck (*Anas superciliosa*), Australian Wood Duck<sup>1</sup> (*Chenonetta jubata*), Mountain Duck<sup>2</sup> (*Tadorna tadornoides*), Grey Teal (*Anas gracilis*), Chestnut Teal (*Anas castanea*), Pink-eared Duck (*Malacorhynchus membranaceus*), Hardhead<sup>3</sup> (*Aythya australis*) and Blue-winged Shoveler<sup>4</sup> (*Anas rhynchotis*). The daily bag limit for the opening day of the 2015 season was ten game ducks per hunter (which included a maximum of two Blue-winged Shoveler). However, for the remainder of the season, the daily bag limit was five game ducks per hunter (which included a maximum of one Blue-winged Shoveler). The 2015 bag limit after the opening day was half that between 2011 and 2014.

This survey uses the same methods as telephone surveys performed during the 2005, 2006 and 2009 to 2014 duck hunting seasons (Barker 2006; Gormley and Turnbull 2009, 2010, 2011; Moloney and Turnbull 2012, 2013, 2014).

The 2015 quail hunting season lasted 12 weeks, from 4 April to 30 June (Game Management Authority 2015). The daily bag limit for the 2015 season was 20 quail per hunter, with Stubble Quail (*Coturnix pectoralis*) being the only native species that could legally be hunted.

This survey uses the same methods as telephone surveys performed during the 2008 to 2014 quail hunting seasons (Gormley 2009; Gormley and Turnbull 2009, 2010, 2011; Moloney and Turnbull 2012, 2013, 2014).

---

1. Australian Wood Duck is also referred to as Wood Duck, Maned Duck and Maned Goose.

2. Mountain Duck is also referred to as Australian Shelduck.

3. Hardhead is also referred to as White-eyed Duck.

4. Blue-winged Shoveler is also referred to as Australasian Shoveler.

## 2. Methods

### General methodology

All surveys were conducted by the telephone survey company Marketing Skill on behalf of the Game Management Authority. Estimates of total harvest by Game Licence holders were based on the reported hunting activities of the survey respondents.

For each game type, a series of surveys was performed throughout the corresponding season. Each survey involved telephoning a random sample of Game Licence holders and asking them to report their hunting activities for the periods covered by that survey only. Therefore, although a respondent<sup>5</sup> may have hunted during the periods covered by Surveys 2 and 3, if they were contacted as part of Survey 3, then information was only collected that pertained to the period covered by Survey 3.

The information from the respondents was used to generate an estimate for the whole population of Game Licence holders for each game type. Estimates of harvest were determined for each of the survey periods and were summed to give an estimate of the total season harvest. For each survey period, the proportion of respondents who hunted was used as an estimate of the proportion of Game Licence holders who hunted. The proportion of the Game Licence holders surveyed who had hunted during each survey period was multiplied by the total number of Game Licence holders, yielding the estimated total number of hunters for that survey period.

For each survey period, the average harvest per hunter<sup>6</sup> was estimated from the total reported harvest divided by the number of respondents who hunted. The total harvest for each survey period was estimated by multiplying the average harvest per hunter by the previously estimated total number of hunters for that survey period. Finally, the total season harvest was estimated from the sum of the survey-specific total harvests.

The season harvest per Game Licence holder was also estimated. For each survey period, the average harvest per survey respondent was estimated by multiplying the average harvest per hunter by the proportion of respondents who hunted. The sum of these estimates across the season provided an estimate of the total season harvest per Game Licence holder.

Respondents who hunted were also asked to provide information on whether hunting was conducted on private land or public land (such as State Game Reserves), the name of the town nearest to where they hunted, and the number of days they hunted during the survey period. Regional harvest estimates were calculated by summing the reported harvest for each town, then aggregating these for the corresponding Victorian Catchment Management Authority (CMA) region.

There were differences in the number and length of surveys between the duck and quail surveys, as indicated in the following sections. Additional details of the methods, as well as examples of the calculations, are provided in Appendix 1. Information describing and interpreting boxplots is provided in Appendix 2.

### Duck

Samples were drawn from hunters who held a Game Licence to hunt ducks during the 2015 season. A random sample of 200 licence holders was interviewed by telephone immediately after opening weekend (Duck Survey 1), followed by surveys of independent random samples of licence holders at two-week intervals for the remainder of the duck season (Duck Surveys 2–7). Respondents were also asked to report the number of each species harvested.

### Quail

Samples were drawn from hunters who held a Game Licence to hunt quail during the 2015 season. A random sample of 300 licence holders was interviewed by telephone after the opening weekend (Survey 1) and in April (excluding opening weekend, Survey 2), May (Survey 3) and June (Survey 4). Respondents were asked to report the number of Stubble Quail harvested, the type of grassland where hunting occurred (native, stubble or introduced) and whether or not dogs were used.

5. Respondent refers to Game Licence holders who were contacted and agreed to take part in the survey.

6. Hunter refers to a Game Licence holder who actually went out and hunted (successfully or unsuccessfully) at some point during the period with which the survey was concerned.



### 3. Results

#### Duck

##### Summary of responses for duck surveys in 2015

The number of Game Licence holders endorsed to hunt ducks remained relatively constant throughout the season, increasing from 24,918 at opening weekend to 25,837 at the end of the season (Table 1). To achieve the required sample size of respondents, slightly more than 200 licence holders were contacted each survey, with an average of 98.5% of those contacted being willing to take part.

**Table 1**

Duck Survey	Period	Licence holders	Respondents	Respondents who hunted	Days hunted*	Ducks harvested**
1	21 Mar – 22 Mar	24,918	200	110	175	647
2	23 Mar – 4 Apr	24,918	200	39	141	419
3	5 Apr – 18 Apr	25,418	200	34	90	290
4	19 Apr – 2 May	25,418	200	39	82	245
5	3 May – 16 May	25,613	200	35	91	258
6	17 May – 30 May	25,613	200	28	69	190
7	31 May – 8 Jun	25,837	200	36	69	221

\* Days hunted indicates the combined number of days that hunting took place by respondents.

\*\* Ducks harvested indicates total number of ducks harvested by respondents.

##### Proportion and corresponding total number of duck licence holders who hunted in each survey period in 2015

The proportion of duck Game Licence holders who hunted in each survey period varied throughout the season: 55% of licence holders hunted during opening weekend, corresponding to 13,705 hunters (Table 2). The proportion who hunted during other survey periods varied from 14% to 20%, corresponding to between 3,586 and 4,957 duck hunters, respectively (Table 2).

**Table 2**

Period	Proportion	SE	95%CI		Total hunters	SE	95%CI	
			Lower	Upper			Lower	Upper
21 Mar – 22 Mar	0.55	0.035	0.49	0.62	13,705	877	12,092	15,533
23 Mar – 4 Apr	0.20	0.028	0.15	0.26	4,859	698	3,672	6,430
5 Apr – 18 Apr	0.17	0.027	0.13	0.23	4,321	675	3,187	5,858
19 Apr – 2 May	0.20	0.028	0.15	0.26	4,957	712	3,745	6,559
3 May – 16 May	0.18	0.027	0.13	0.24	4,482	688	3,323	6,045
17 May – 30 May	0.14	0.025	0.10	0.20	3,586	628	2,550	5,042
31 May – 8 Jun	0.18	0.027	0.13	0.24	4,651	702	3,466	6,241

### Average harvest of ducks per hunter (Game Licence holders who hunted) for each survey period in 2015

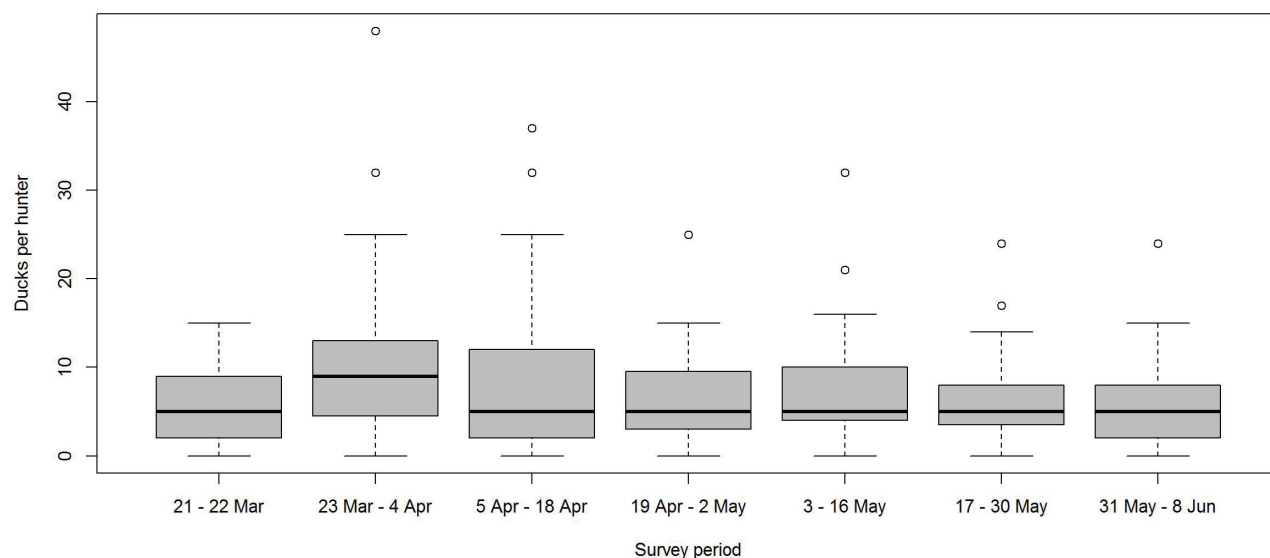
Table 3 shows the average harvest of game ducks for each survey period by Game Licence holders licensed to hunt duck who actually hunted. The average number of ducks per hunter varied throughout the season. The average harvest per hunter was 5.9 ducks on opening weekend, which was the lowest average harvest per hunter in any period, and the largest average harvest per hunter was 10.7 ducks in the second survey period.

**Table 3**

Period	Average harvest per hunter*	SE	95%CI	
			Lower	Upper
21 Mar – 22 Mar	5.88	0.45	5.06	6.84
23 Mar – 4 Apr	10.74	1.55	8.12	14.22
5 Apr – 18 Apr	8.53	1.58	5.95	12.22
19 Apr – 2 May	6.28	0.81	4.88	8.09
3 May – 16 May	7.37	1.09	5.52	9.85
17 May – 30 May	6.79	1.09	4.97	9.27
31 May – 8 Jun	6.14	0.87	4.66	8.08

\* Average harvest per hunter = Ducks harvested divided by Respondents who hunted (Table 1).

Within each survey period, there was large variation in the reported harvest of ducks per hunter (i.e. per Game Licence holder who hunted). Some hunters harvested more than 30 ducks in a survey period, whereas some did not harvest any ducks (Figure 1).



**Figure 1: Boxplot of the number of ducks reported harvested by individual hunters for each survey period in 2015. The bottom and top of each 'box' indicates the 25th and 75th percentiles, respectively, with the black horizontal line indicating the median reported value.**



### Estimates of the duck harvest in Victoria in 2015 by holders of a duck Game Licence

There were an estimated 80,610 ducks harvested during opening weekend (95%CI = 66,288–98,0026), which was more than double the estimate for any two-week survey period in April to June. The harvest throughout the remainder of the season varied considerably between surveys, with fortnightly estimates ranging from 24,332 to 52,203 ducks harvested. The total season harvest estimate was 286,729 (95%CI = 249,645–329,322; Table 4).

The fact that opening weekend had the lowest average harvest per hunter as well as the highest estimated duck harvest is explained by the larger number of Game Licence holders hunting on opening weekend (~13,700) compared to other surveys (<5,000).

**Table 4**

Period	Total harvest*	SE	95%CI	
			Lower	Upper
21 Mar – 22 Mar	80,610	8,065	66,288	98,026
23 Mar – 4 Apr	52,203	10,613	35,188	77,447
5 Apr – 18 Apr	36,856	8,922	23,088	58,835
19 Apr – 2 May	31,137	6,024	21,385	45,337
3 May – 16 May	33,041	7,058	21,840	49,986
17 May – 30 May	24,332	5,774	15,380	38,495
31 May – 8 Jun	28,550	5,900	19,122	42,626
<b>Season total</b>	<b>286,729</b>	<b>20,286</b>	<b>249,645</b>	<b>329,322</b>

\* Total harvest = Harvest per hunter (Table 3) × Total hunters (Table 2). Numbers may differ slightly due to rounding of average harvest per hunter.

### Estimated average harvest of ducks per Game Licence holder in each survey period in 2015

Table 5 is the average of all Game Licence holders who are licensed to hunt duck. The total average season harvest per licence holder was estimated to be 11.4 (95%CI = 9.9–13.0). Note that, for each survey period, the average duck harvest per Game Licence holder was lower than the average duck harvest per hunter, as the former includes those respondents who did not hunt during the survey period, whereas the latter includes only those who hunted.

**Table 5**

Period	Average harvest*	SE	95%CI	
			Lower	Upper
21 Mar – 22 Mar	3.24	0.32	2.66	3.93
23 Mar – 4 Apr	2.10	0.43	1.41	3.11
5 Apr – 18 Apr	1.45	0.35	0.91	2.31
19 Apr – 2 May	1.23	0.24	0.84	1.78
3 May – 16 May	1.29	0.28	0.85	1.95
17 May – 30 May	0.95	0.23	0.60	1.50
31 May – 8 Jun	1.11	0.23	0.74	1.65
<b>Season total</b>	<b>11.35</b>	<b>0.80</b>	<b>9.88</b>	<b>13.04</b>

\* Average harvest per Game Licence holder = Ducks harvested divided by Respondents (Table 1).

### Reported numbers of ducks harvested by hunters, proportion of the total harvest, and estimated total 2015 harvest for each duck species

Total harvest estimates for each species were obtained by multiplying the total estimated duck harvest by the percentages of total harvest for that species (Table 6). The most frequently harvested species was Pacific Black Duck, comprising 29% of the total reported harvest, followed by Grey Teal (28%) and Australian Wood Duck (28%). The remaining five species comprised 15% of the total harvest.

**Table 6**

Species	Reported harvest	Proportion of harvest	SE	Estimated harvest	SE	95%CI	
						Lower	Upper
Australian Wood Duck	643	0.28	0.009	80,194	6,277	46,825	137,344
Blue-winged Shoveler	12	0.01	0.002	1,497	444	551	4,063
Chestnut Teal	156	0.07	0.005	19,456	2,039	10,480	36,122
Grey Teal	641	0.28	0.009	79,945	6,260	46,674	136,931
Hardhead	8	0.00	0.001	998	359	337	2,958
Mountain Duck	55	0.02	0.003	6,860	1,035	3,290	14,300
Pacific Black Duck	657	0.29	0.009	81,940	6,396	47,878	140,236
Pink-eared Duck	127	0.06	0.005	15,839	1,767	8,374	29,961

### Days hunted per Game Licence holder for 2015

Each Game Licence holder hunted an average of 3.6 days during the 2015 duck hunting season (Table 7). When multiplied by the total number of Game Licence holders in each survey period, this equated to a total of 90,634 hunter days (95%CI = 77,142–106,485).

**Table 7**

Period	Days hunted	SE	95%CI	
			Lower	Upper
21 Mar – 22 Mar	0.88	0.06	0.76	1.01
23 Mar – 4 Apr	0.71	0.13	0.50	1.00
5 Apr – 18 Apr	0.45	0.09	0.30	0.67
19 Apr – 2 May	0.41	0.07	0.29	0.58
3 May – 16 May	0.46	0.09	0.31	0.67
17 May – 30 May	0.35	0.09	0.21	0.58
31 May – 8 Jun	0.35	0.06	0.24	0.49
<b>Total per licence holder</b>	<b>3.59</b>	<b>0.23</b>	<b>3.16</b>	<b>4.07</b>
<b>Total hunting days</b>	<b>90,634</b>	<b>7,466</b>	<b>77,142</b>	<b>106,485</b>

### Percentage of days hunted and associated duck harvest by land tenure in 2015

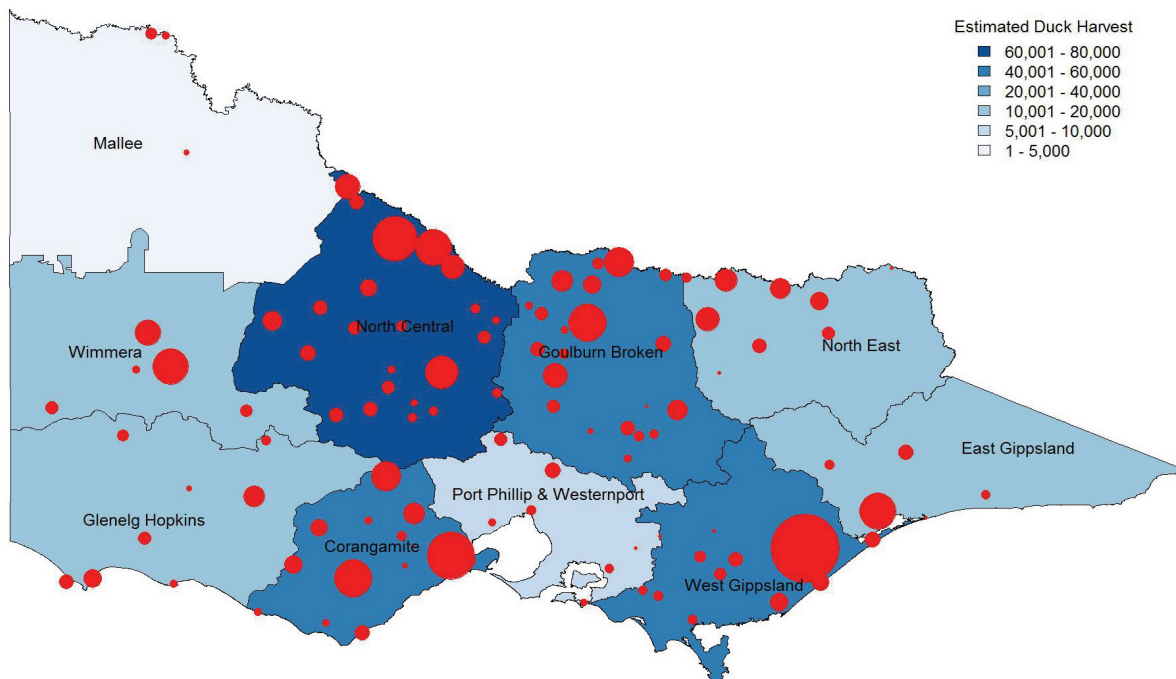
Similar duck hunting effort was expended on public land (49.5%) as on private land (45.5%), with a similar proportion of ducks being harvested solely on public or private land (50.4% on public land versus 43.9% on private land) (Table 8).

**Table 8**

Land tenure	Days	Duck harvest
Private land only	45.5%	44%
Public land only	49.5%	50.4%
Both	5%	5.6%
Total	100%	100%

### Estimated total duck harvest in 2015 by CMA region

Total harvest was estimated to be greatest in the North Central CMA, followed by the West Gippsland CMA, the Corangamite CMA and the Goulburn Broken CMA (Figure 2). The top five towns for the total reported number of ducks harvested were (in descending order) Sale, Geelong, Kerang, Shepparton and Colac. The top five towns for the total number of reported duck hunting days were (in descending order) Sale, Geelong, Kerang, Horsham and Bendigo.



**Figure 2. Red circles indicate the nearest town to harvest locations, with symbol size proportional to reported harvest.**

## Quail

### Summary of responses for quail surveys in 2015

The number of Game Licence holders endorsed to hunt quail was consistent throughout the season (Table 9). To achieve the required sample size of respondents, slightly more than 300 licence holders were contacted each survey, with an average of 98.3% of those contacted being willing to take part.

**Table 9**

Quail survey	Period	Licence holders	Respondents	Respondents who hunted	Days hunted <sup>*</sup>	Quail harvested <sup>**</sup>
1	Opening weekend	28,100	300	22	26	146
2	April <sup>***</sup>	28,100	300	43	115	398
3	May	28,375	300	20	47	370
4	June	28,676	300	19	50	160

\* Days hunted indicates the combined number of days that hunting took place by respondents.

\*\* Quail harvested indicates total number of quail harvested by respondents.

\*\*\* April excludes surveys from opening weekend.

### Proportion and corresponding total number of quail licence holders who hunted in each survey period in 2015

The proportion of Game Licence holders endorsed to hunt quail who actually hunted quail halved after the April survey period, from 14% to 7%. There were an estimated 2,061 Game Licence holders who hunted quail on opening weekend, and 4,028, 1,891 and 1,816 in the subsequent months (Table 10).

**Table 10**

Period	Proportion	SE	95%CI		Total hunters	SE	95%CI	
			Lower	Upper			Lower	Upper
Opening weekend	0.07	0.015	0.05	0.11	2,061	423	1,384	3,068
April <sup>*</sup>	0.14	0.020	0.11	0.19	4,028	568	3,058	5,304
May	0.07	0.014	0.04	0.10	1,891	49	1,245	2,875
June	0.06	0.014	0.04	0.10	1,816	403	1,181	2,792

\* April excludes surveys from opening weekend.

### Average harvest of quail per hunter (Game Licence holders who hunted) for each survey period in 2015

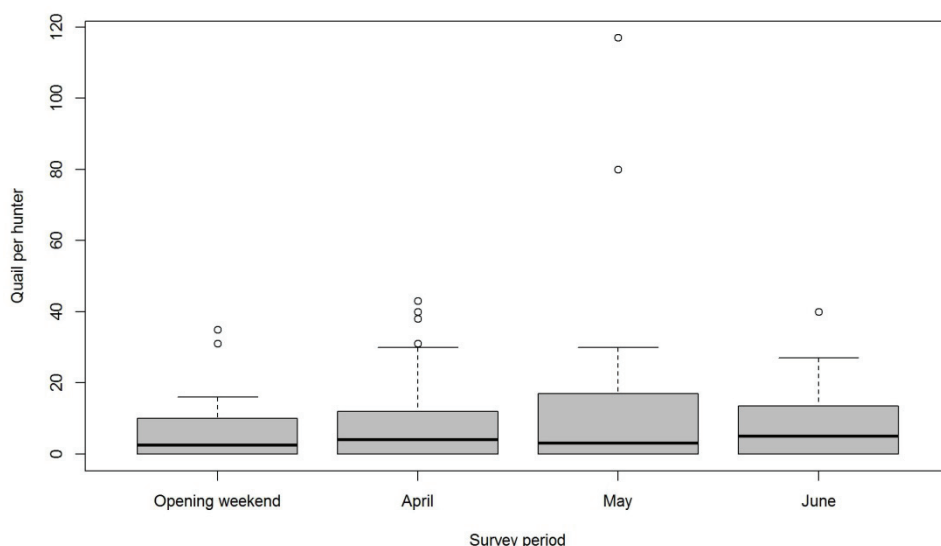
Table 11 shows the average harvest of quail for each survey period by Game Licence holders licensed to hunt quail who actually hunted. The average number of quail harvested per hunter during each survey period varied from 6.6 on opening weekend to 18.5 in May.

**Table 11**

Period	Average harvest per hunter*	SE	95%CI	
			Lower	Upper
Opening weekend	6.64	2.10	3.62	12.17
April*	9.26	1.97	6.13	13.98
May	18.50	7.49	8.62	39.72
June	8.42	2.49	4.77	14.86

\* Average harvest per hunter = Quail harvested divided by Respondents who hunted (Table 9).

Within each survey period, there was large variation in the reported harvest per hunter (i.e. per Game Licence holder who hunted), with some hunters harvesting more than 30 quail, and more than one-quarter harvesting zero quail within a given survey period (Figure 3).



**Figure 3. Boxplot of the number of quail reported harvested by individual hunters for each survey period in 2015. The bottom and top of each 'box' indicates the 25th and 75th percentiles, respectively, with the black horizontal line indicating the median reported value.**

### Estimates of the 2015 quail harvest in Victoria by licensed quail hunters

There were an estimated 101,244 quail harvested by all holders of a Game Licence for quail during the 2015 quail season (95%CI = 68,761–149,074). The June harvest was substantially lower than the April and May harvest totals (Table 12).

**Table 12**

Period	Total harvest*	SE	95%CI	
			Lower	Upper
Opening weekend	13,675	5,161	6,688	27,961
April**	37,279	9,514	22,785	60,993
May	34,996	16,067	14,850	82,470
June	15,294	5,657	7,580	30,856
<b>Season total</b>	<b>101,244</b>	<b>20,182</b>	<b>68,761</b>	<b>149,074</b>

\* Total harvest = Harvest per hunter (Table 11) × Total hunters (Table 10). Numbers may differ slightly due to rounding of average harvest per hunter.

\*\* April excludes surveys from opening weekend.

### Estimated average harvest of quail per Game Licence holder in each survey period in 2015

Table 13 is the average of all Game Licence holders who are licensed to hunt quail. The total average season harvest was 3.6 quail per Game Licence holder (95%CI = 2.4–5.3). Note that, for each survey period, the average quail harvest per Game Licence holder was lower than the average quail harvest per hunter, as the former was averaged across those respondents who did not hunt during the survey period, whereas the latter only included those respondents who hunted.

**Table 13**

Period	Average harvest*	SE	95%CI	
			Lower	Upper
Opening weekend	0.49	0.18	0.24	1.00
April**	1.33	0.34	0.81	2.17
May	1.23	0.57	0.52	2.90
June	0.53	0.20	0.26	1.08
<b>Season total</b>	<b>3.58</b>	<b>0.71</b>	<b>2.43</b>	<b>5.27</b>

\* Average harvest per Game Licence holder = Quail harvested divided by Respondents (Table 9).

\*\* April excludes surveys from opening weekend.

### Days hunted per Game Licence holder for 2015

The number of hunting days per licence holder in each of May and June was one-third that of April. On average, each quail licence holder hunted on 0.8 days during the 2015 season, corresponding to 22,431 hunter days (95%CI = 16,684–30,160; Table 14).

**Table 14**

Period	Days hunted	SE	95%CI	
			Lower	Upper
Opening weekend	0.09	0.02	0.06	0.13
April*	0.38	0.07	0.27	0.54
May	0.16	0.04	0.09	0.26
June	0.17	0.05	0.10	0.28
<b>Total per licence holder</b>	<b>0.79</b>	<b>0.09</b>	<b>0.63</b>	<b>1.00</b>
<b>Total hunting days</b>	<b>22,431</b>	<b>3,407</b>	<b>16,684</b>	<b>30,160</b>

### Percentage of days hunted and associated quail harvest by land tenure in 2015

Most quail hunting was conducted on private land (81.1% of the hunting days), accounting for 81.4% of the harvested quail (Table 15). A small proportion of hunting was conducted in State Game Reserves (7.1%) or both private land and State Game Reserves during the same hunting trip (7.6%). The percentage of quail hunting days where dogs were used (76.5%) was smaller than the percentage of quail harvested using dogs (82.0%, Table 15).

**Table 15**

Land tenure	Days			Quail harvest			
	No dog	Dog used	Total	No dog	Dog used	Total	
Private land only	14.7%	66.4%	81.1%	15.7%	65.6%	81.4%	
State Game Reserves only	4.2%	2.9%	7.1%		0.4%	4.2%	4.6%
Both	0.4%	7.1%	7.6%		0.0%	12.2%	12.2%
<b>Total</b>	<b>19.3%</b>	<b>76.5%</b>	<b>95.8%</b>		<b>16.1%</b>	<b>82.0%</b>	<b>98.1%</b>



### Percentage of hunting days and associated quail harvest per habitat type in 2015

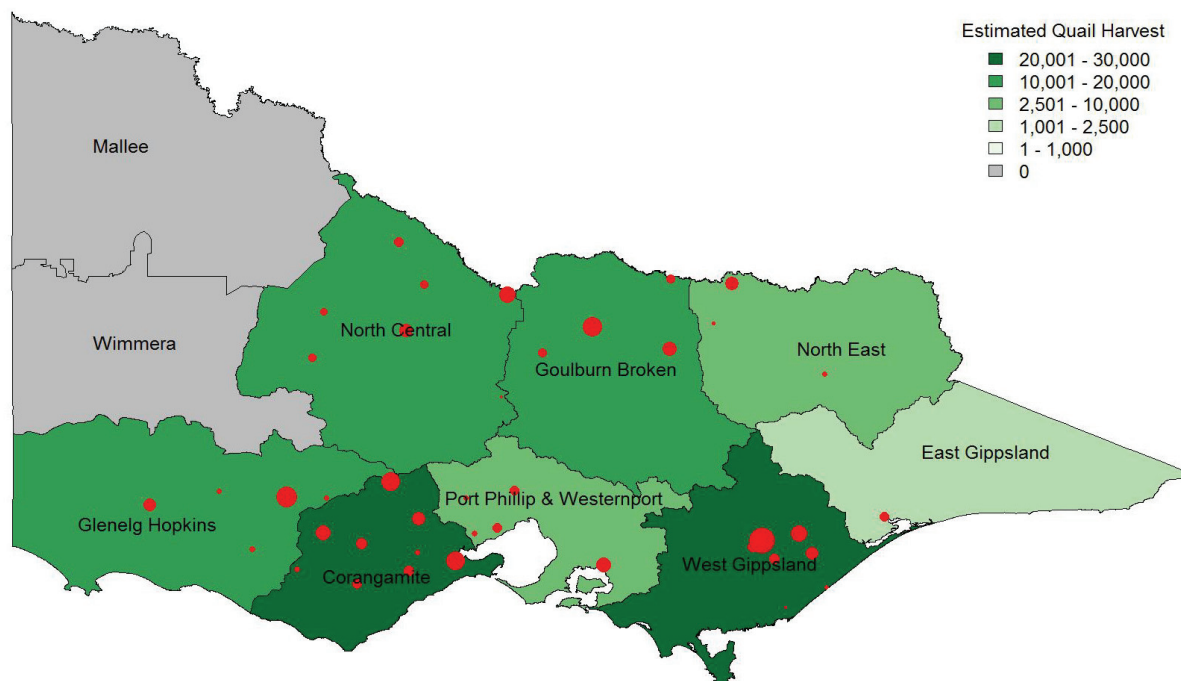
More quail hunting and quail harvesting took place on stubble (38.2% and 35.2%, respectively) than on other individual grassland types or combinations of grasslands. Stubble and introduced grassland performed well in terms of return, as only 5.9% of quail hunting days was spent in that combination, but they yielded 21.9% of the harvest (Table 16).

**Table 16**

Grassland	Days	Quail harvest
Introduced grass	12.6%	13.1%
Introduced and native grass	1.3%	0.0%
Native grass	18.1%	16.1%
Native and introduced grass and stubble	16.8%	9.5%
Stubble	38.2%	35.2%
Stubble and introduced grass	5.9%	21.9%
Stubble and native grass	3.8%	3.6%
<b>Total</b>	<b>92.9%</b>	<b>95.8%</b>

### Estimated total quail harvest in 2015 by CMA region

The total quail harvest was greatest in the Corangamite CMA and the West Gippsland CMA (Figure 4). The top five towns for total reported number of quail harvested were (in descending order) Cowwarr, Streatham, Shepparton, Geelong and Ballarat. The top five towns for total number of reported quail hunting days were (in descending order) Echuca, Shepparton, Sale, Geelong and Rushworth.

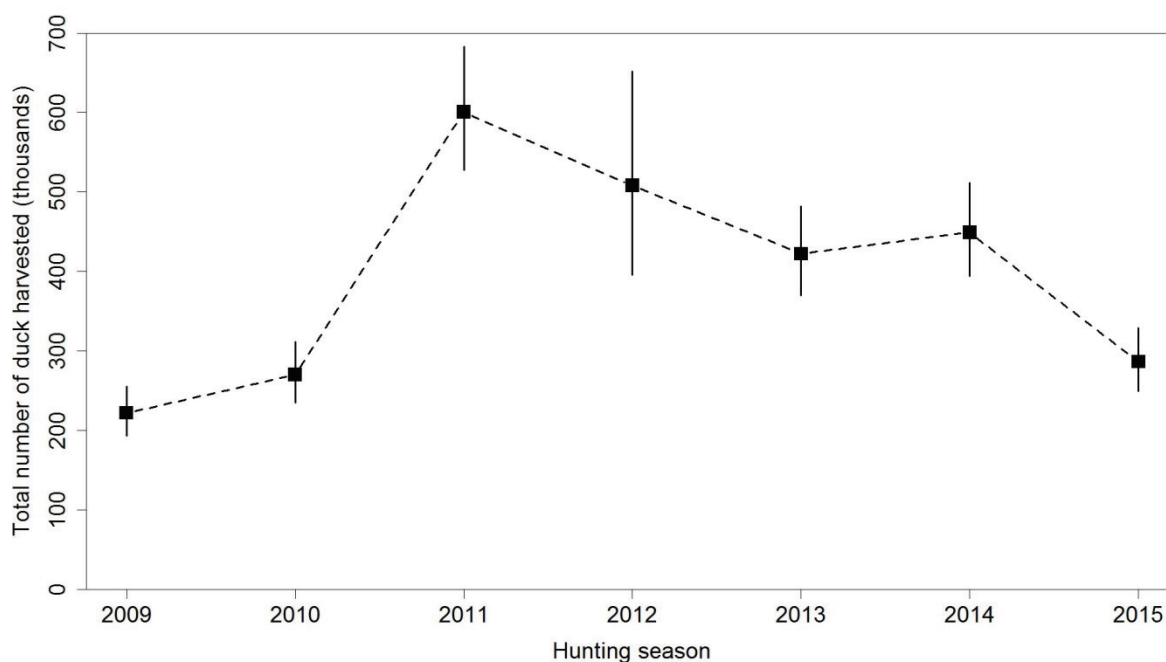


**Figure 4.** Red circles indicate the nearest town to harvest locations, with symbol size proportional to reported harvest.

## 4. Discussion

### Duck

A total of 286,729 ducks were estimated to have been harvested in Victoria during the 2015 season (95%CI = 249,645–329,322), the lowest number since 2010 and less than two-thirds of the 2014 estimated harvest (Table 17 and Figure 5). The reduced harvest relative to 2014 was consistent across most species, with the exception of Pink-eared Duck (which increased slightly), Hardhead (which only had one-sixth of the 2014 harvest) and Blue-winged Shoveler (which only had one-third of the 2014 harvest). The estimated duck harvest per licence holder was the lowest since 2009, and only two-thirds that of 2014. The estimated hunting days per licence holder was also the lowest recorded, and a 20% reduction from 2014. Some of this may be explained by the change in bag limits, from ten ducks per day in 2014 to five ducks per day in 2015 (except for opening day, when the limit was still ten ducks). Hunter efficiency (ducks per hunting day) was 83% of 2014, and the lowest since 2010, a year that also had reduced bag limits (Table 17 and Gormley and Turnbull, 2010).



**Figure 5. Estimated total duck harvests (in thousands) from 2009 to 2015. The square is the estimate for each season; the solid line indicates the 95% confidence interval.**

Opening weekend was an important time for duck hunting in Victoria in 2015. More than half (55%) of duck Game Licence holders hunted, accounting for 24% of the total duck hunting days and 28% of the total duck harvest. This can be compared with 2014, when 60% of duck Game Licence holders hunted and accounted for 22% of the total hunting days and 20% of the total duck harvest for 2014. Of duck Game Licence holders who hunted on opening weekend, 13% reported harvesting their bag limits each day, accounting for 8% of ducks harvested during the 2015 season. For the 2014 season, these numbers were substantially lower, at 4% and 3%, respectively. In 2015, a further 8% of those licence holders who hunted on opening weekend and were surveyed reported harvesting between 10 and 14 ducks on opening weekend. This group accounted for a further 4.8% of the ducks harvested during the 2015 season.

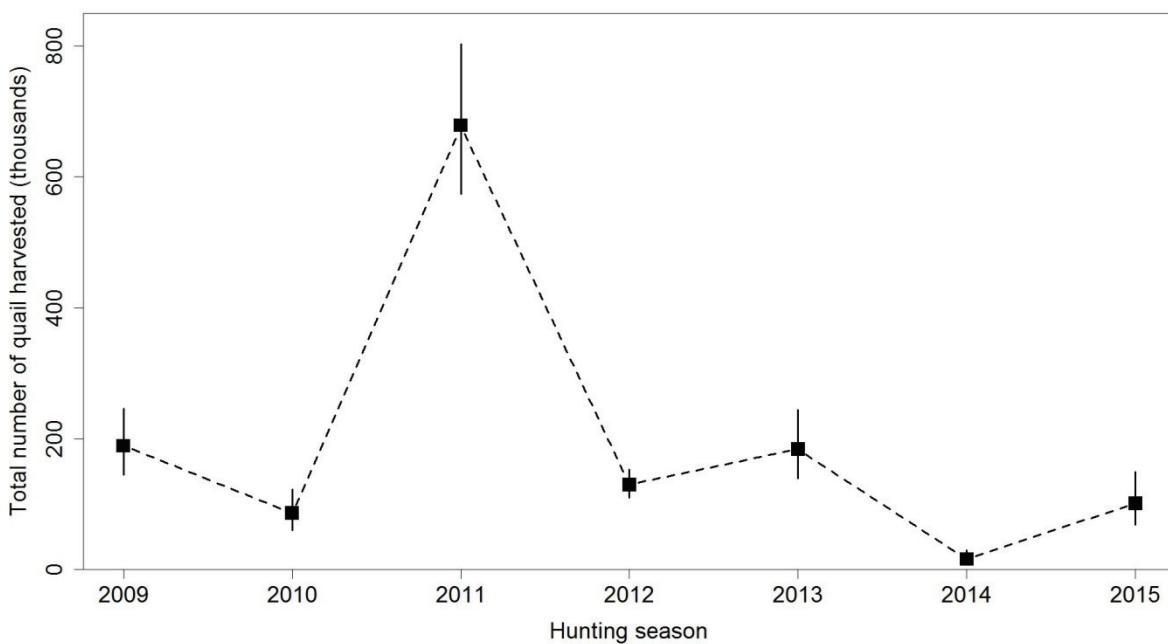
**Table 17. Comparison of duck harvests, 2009–2015 (data based on all licensed duck hunters)**

	2009	2010	2011	2012	2013	2014	2015
<b>Season daily bag limit</b>	2 ducks with an additional 3 Wood Ducks	5 ducks with an additional 3 Wood Ducks	10 ducks	10 ducks	10 ducks	10 ducks	10 ducks on opening day, 5 ducks for remainder of season
<b>Harvest by species</b>							
Australian Wood Duck	131,084	112,390	132,908	150,150	106,553	131,282	80,194
Blue-winged Shoveler	NA	216	4,854	1,319	7,104	4,155	1,497
Chestnut Teal	13,176	14,354	49,812	23,506	39,804	29,866	19,456
Grey Teal	20,919	26,011	211,034	110,574	135,947	127,126	79,945
Hardhead	NA	324	25,657	30,222	7,349	6,363	998
Mountain Duck	2,173	5,936	8,090	9,234	2,694	8,440	6,860
Pacific Black Duck	55,150	96,487	156,484	160,704	92,714	127,646	81,940
Pink-eared Duck	NA	0	12,597	21,587	30,129	14,154	15,839
<b>Total harvest</b>	<b>222,302</b>	<b>270,574</b>	<b>600,739</b>	<b>508,256</b>	<b>422,294</b>	<b>449,320</b>	<b>286,729</b>
Hunting days	76,659	85,801	103,450	109,718	91,748	118,800	90,634
Ducks per hunting day	2.89	3.15	5.8	4.63	4.6	3.78	3.16
Ducks per licence holder	11.10	12.54	26.02	21.19	17.24	17.29	11.35
Hunting days per licence holder	3.98	3.98	4.48	4.60	3.75	4.57	3.59

Note: The 2009, 2010, 2011, 2012, 2013 and 2014 estimates are from Gormley and Turnbull (2009), Gormley and Turnbull (2010), Gormley and Turnbull (2011), Moloney and Turnbull (2012), Moloney and Turnbull (2013) and Moloney and Turnbull (2014), respectively.

## Quail

The total of 101,244 quail estimated to have been harvested in Victoria during the 2015 season (95%CI = 68,761–149,074) is a significant increase from the 2014 harvest of 16,243, i.e. more than six times larger (Figure 6 and Table 18). The 2015 season, however, had the third-lowest harvest since the survey began in 2009: only 2010 and 2014 were lower. For the first time, quail hunters were surveyed on their effort and success for the quail season opening weekend. The results indicated that the 2015 opening weekend accounted for 13.5% of the quail harvested. Furthermore, more than 50% of the quail harvest occurred in April.



**Figure 6. Estimated total quail harvests (in thousands) from 2009 to 2015. The square is the estimate for each season; the solid line indicates the 95% confidence interval.**

**Table 18. Comparison of quail harvests of 2009–2015.**

	2009	2010	2011	2012	2013	2014	2015
<b>Total harvest</b>	<b>189,155</b>	<b>86,302</b>	<b>678,431</b>	<b>129,711</b>	<b>184,123</b>	<b>16,243</b>	<b>101,244</b>
Hunting days	24,648	24,739	46,719	22,262	21,958	10,852	22,432
Quail per licence holder	7.89	3.59	26.17	4.80	6.69	0.56	3.58
Hunting days per licence holder	1.03	1.03	1.80	0.82	0.98	0.38	0.79
Quail per hunting day	7.97	3.48	14.52	5.81	8.39	1.47	4.51

Note: The 2009, 2010, 2011, 2012 and 2013 estimates are from Gormley and Turnbull (2009), Gormley and Turnbull (2010), Gormley and Turnbull (2011), Moloney and Turnbull (2012) and Moloney and Turnbull (2013), respectively.

It should be noted that the number of hunting days was only an estimate of total effort: someone who hunted for two hours and someone else who hunted for 12 hours were both recorded as having hunted for one day.

Due to the structure of Game Licences in Victoria, not every holder of a Game Licence endorsed to hunt quail will hunt quail. The price of a Game Licence for game birds including duck is the same as a Game Licence for game birds not including duck. Anyone who wants to hunt ducks automatically has quail included in their licence. For many hunters, duck hunting will be their primary activity. Hence, a high proportion of Game Licence holders will be permitted to hunt quail, even though they may not intend to do so. This does not affect the estimates of quail harvest, because the calculations explicitly account for the proportion of quail Game Licence holders who did not actually hunt quail.

## Locations with the most hunting days

Combining duck and quail, Sale had the most hunting days during the 2015 hunting seasons, followed by Geelong, Kerang, Shepparton and Bendigo. This assumed that all hunting days were equal in length, even though the time spent hunting on any particular day could vary considerably for each respondent, and for game species. Sale had the highest estimated hunting days for duck. Horsham and Echuca had the equally highest estimated hunting days for quail.

## Assumptions

The estimates of harvest for each game type were derived with the assumption that the samples of respondents were representative of the entire population of Victorian Game Licence holders. This assumption may have been violated due to several factors, such as the reasons for non-response (exceeded bag limit, or conversely did not harvest anything), memory recall (respondents not remembering their harvest), and deliberate over- or under-reporting (reported numbers knowingly being reported incorrectly). Bias due to non-response is likely to have been negligible, because the response rate for all surveys was generally above 95% (i.e. very high). Memory bias can inflate estimates of total harvest, in some cases by as much as 40% (Wright 1978; Barker 1991). It is likely, however, that the sampling strategy of telephone interviews after each two-week period in the case of ducks and quail would have ensured that both memory bias and non-response bias were kept low when compared with postal surveys and complete end-of-season surveys (Barker 1991; Barker et al. 1992). Nevertheless, some bias likely remains, and the estimates of total harvest should be interpreted with care.

Due to the length of the quail hunting trip not being surveyed in the quail surveys in May and June, it was assumed that the length of each quail hunting trip was one day. In 2013 and 2014 combined, 87.5% of quail hunting trips only lasted one day; thus, the assumption seems reasonable.

It is important to note that the methodology explicitly accounts for the possibility that not every Game Licence holder hunts in every survey period (see Gormley and Turnbull 2010). Therefore, the estimate of total season bag per Game Licence holder is the sum of the 'harvest per Game Licence holder', not the sum of the 'harvest per hunter'.

The uncertainty in the estimates of total harvest (as indicated by the confidence intervals) was due to two factors. First, there was variation in the reported numbers of animals harvested between respondents who had hunted (see Figure 1 and Figure 3). For example, within a given survey period for duck hunting, some respondents indicated that they hunted unsuccessfully, whereas others took multiple trips and indicated a total harvest of more than 50 ducks during the same period. The second source of uncertainty was due to sampling of hunters, rather than taking a complete census. However, the degree of sampling uncertainty was reduced by having sample sizes of 200 respondents per survey for ducks and 300 respondents per survey for quail. Statistically, these sample sizes are considered adequate to provide reasonable estimates.

The spatial distributions of the duck and quail harvest should also be interpreted with care. Grouping the harvest for a relatively large region (CMA) provides a broad-scale view of the distribution of the harvest. Grouping by smaller regions would provide a finer-scale representation, but this would come at the cost of increased bias in many regions. Because the data are from a sample of Game Licence holders rather than a complete census, it is likely that some areas that were actually hunted are shown as having a zero harvest if no respondents that hunted those areas were contacted. This would be increasingly likely at finer spatial scales. Furthermore, respondents were only asked to report the nearest town to where they hunted, not the actual location. It is, therefore, possible that the nearest town was in a different CMA than the hunting location.

## References

- Barker, R.J. (1991). Nonresponse to New Zealand waterfowl harvest surveys. *Journal of Wildlife Management* **55**, 126–131.
- Barker, R.J. (2006). Survey of waterfowl hunting in Victoria by Victorian licence holders 2006. Report for the Game Management Unit, Department of Sustainability and Environment, Victoria.
- Barker, R.J., Geissler, P.H. and Hoover, B.A. (1992). Sources of nonresponse to the Federal Waterfowl Hunter Questionnaire Survey. *Journal of Wildlife Management* **56**, 337–343.
- Game Management Authority. (2015). Game hunting in Victoria. <http://www.gma.vic.gov.au> (accessed 20 November 2015).
- Gormley, A.M. (2009). Survey of quail hunting in Victoria by Victorian licence holders 2008. Report for the Game Management Unit, Department of Sustainability and Environment, Victoria. 10 pp.
- Gormley, A.M. and Turnbull, J.D. (2009). Estimates of harvest for deer, duck and quail in Victoria: results from surveys of Victorian Game Licence holders in 2009. Arthur Rylah Institute for Environmental Research Technical Report Series No. 196. Department of Sustainability and Environment, Heidelberg, Victoria.
- Gormley, A.M. and Turnbull, J.D. (2010). Estimates of harvest for deer, duck and quail in Victoria: results from surveys of Victorian Game Licence holders in 2010. Arthur Rylah Institute for Environmental Research Technical Report Series No. 210. Department of Sustainability and Environment, Heidelberg, Victoria.
- Gormley, A.M. and Turnbull, J.D. (2011). Estimates of harvest for deer, duck and quail in Victoria: results from surveys of Victorian Game Licence holders in 2011. Arthur Rylah Institute for Environmental Research Technical Report Series No. 224. Department of Sustainability and Environment, Heidelberg, Victoria.
- Hall, G.P. (2013). Ecology and management of quail in Australia. SSAA Inc., Unley, South Australia.
- Moloney, P.D. and Turnbull, J.D. (2012). Estimates of harvest for deer, duck and quail in Victoria: results from surveys of Victorian Game Licence holders in 2012. Arthur Rylah Institute for Environmental Research Technical Report Series No. 239. Department of Sustainability and Environment, Heidelberg, Victoria.
- Moloney, P.D. and Turnbull, J.D. (2013). Estimates of harvest for deer, duck and quail in Victoria: results from surveys of Victorian Game Licence holders in 2013. Arthur Rylah Institute for Environmental Research Technical Report Series No. 251. Department of Environment and Primary Industries, Heidelberg, Victoria.
- Moloney, P.D. and Turnbull, J.D. (2014). Estimates of harvest for deer, duck and quail in Victoria: results from surveys of Victorian Game Licence holders in 2014. Arthur Rylah Institute for Environmental Research Unpublished Client Report for Game Management Authority. Arthur Rylah Institute for Environmental Research, Department of Environment, Land, Water and Planning, Heidelberg, Victoria.
- Wright, V.L. (1978). Causes and effects of biases on waterfowl harvest estimates. *Journal of Wildlife Management* **42**: 251–262.



# Appendix 1

## Common definitions used

SD = standard deviation of the data. Represents the variation in the numbers reported.

SE = standard error of the mean. Represents the variation in the estimated mean.

CV = coefficient of variation. Calculated as:  $CV = SE \div \text{mean}$ . This provides an indication as to how much uncertainty is in the estimate relative to the mean.

## Calculations

For each survey  $j$ , we surveyed  $n_j$  respondents, of which  $h_j$  had hunted. The proportion of respondents who hunted in each period  $j$  is given by:

$$p_j = \frac{h_j}{n_j} \quad \text{e.g. for Duck Survey 3, we obtained: } \frac{34}{200} = 0.170.$$

The total number of hunters for each survey period ( $H_j$ ) was estimated by multiplying the total number of licence holders ( $L$ ) by the proportion of respondents who reported having hunted during that survey period ( $p_j$ ), as found previously:

$$H_j = p_j L \quad \text{e.g. for Duck Survey 3, we obtained: } 0.17 \times 25418 = 4,321.$$

The estimated average harvest per hunter ( $w_j$ ) is the total reported harvest for survey  $j$  ( $y_j$ ) divided by the total number of respondents who hunted ( $h_j$ ):

$$w_j = \frac{y_j}{h_j} \quad \text{e.g. for Duck Survey 3, we obtained: } \frac{290}{34} = 8.53.$$

The total harvest for each survey period ( $W_j$ ) was estimated by multiplying the average harvest per hunter ( $w_j$ ) by the total number of hunters ( $H_j$ ):

$$W_j = w_j H_j \quad \text{e.g. for Duck Survey 3, we obtained: } 8.53 \times 4,321 = 36,856.$$

The estimate of the total harvest was calculated as the sum of the estimated harvest for each survey period:

$$W_{TOT} = W_1 + W_2 + W_3 + W_4 + W_5 + W_6 + W_7.$$

Standard errors (SEs) for the proportion of respondents who hunted are given by:

$$SE(p_j) = \sqrt{\frac{p_j(1-p_j)}{n_j}} \quad \text{e.g. for Duck Survey 3, we obtained: } \sqrt{\frac{0.17 \times 0.83}{200}} = 0.027.$$

Standard errors for the average harvest per hunter are given by:

$$SE(w_j) = \frac{SD(w_j)}{\sqrt{h_j}}, \text{ e.g. for Duck Survey 3, we obtained: } \frac{9.196}{\sqrt{34}} = 1.58.$$

The standard error for the total estimated harvest per survey period ( $W_j$ ) was found by determining the coefficient of variation (CV) of  $p_j$  and  $w_j$  and then adding their sum of squares to find the combined CV (assuming independence).

$$CV(w_j) = \frac{SE(w_j)}{w_j}, \text{ and } CV(p_j) = \frac{SE(p_j)}{p_j}$$

$$CV(W_j) = \sqrt{(CV(w_j))^2 + (CV(p_j))^2}$$

$$SE(W_j) = CV(W_j) \times W_j.$$

The standard error of the total harvest was calculated by:

$$SE(W_{TOT}) = \sqrt{(SE(W_1))^2 + (SE(W_2))^2 + \dots + (SE(W_7))^2}.$$

Confidence intervals were computed on the natural logarithm scale and back-transformed to ensure that lower limits were  $\geq 0$ . A consequence is that the confidence intervals were asymmetric and cannot be reported as the estimate plus or minus a fixed value. In general, for some estimates denoted as  $\hat{X}$ , 95% confidence interval limits were calculated using:

$$\text{upper limit} = \hat{X} \times r$$

$$\text{lower limit} = \hat{X} \div r, \quad \text{where:}$$

$$r = \exp\left(1.96\sqrt{\ln(1 + CV^2)}\right),$$

e.g. for the total duck harvest we have

$$CV = \frac{20,286}{286,729} = 0.071$$

$$r = \exp\left(1.96\sqrt{\ln(1 + 0.071^2)}\right) = 1.15.$$

Therefore, Upper and Lower Confidence Intervals are given by:

$$UL = 286,729 \times 1.15 = 329,321$$

$$LL = 286,729 \div 1.15 = 249,645.$$

## Appendix 2

### Explanation of what goes into a boxplot

A boxplot is a way of displaying key points of the data and is especially good for comparing groups of data. They are sometimes referred to as box-and-whisker plots. A boxplot shows the following key points:

- outliers, signified by hollow circles
- minimum, signified by the horizontal line below the box (smallest value, excluding outliers)
- lower quartile (Q1), signified by the horizontal line at the bottom of the box (25% of the data is at this point or below)
- median, signified by the thick horizontal line in the box (50% of the data is at this point or below)
- upper quartile (Q3), signified by the horizontal line at the top of the box (75% of the data is at this point or below)
- maximum, signified by the horizontal line above the box (largest value, excluding outliers)
- interquartile range or IQR (difference between the upper and lower quartiles)
- whiskers – the lines that go from the minimum or maximum to the box.

Outliers are values that are very large (or small) compared with the rest of the data. Formally, an outlier is any point that is either below  $Q1 - 1.5 \times IQR$  or above  $Q3 + 1.5 \times IQR$ , which means that any point that lies more than one-and-a-half times the length of the box outside the box is an outlier.

The boxplot indicates the spread of the data. The data is broken into quarters: 25% of the data are in each whisker and between the edge of the box and the median line. Approximately half the data are contained within the box. Any unusual data are highlighted as outliers. As an example, Figure A2.1 shows a boxplot indicating that most hunters harvested between 5 and 13 ducks, and a quarter harvested more than about 27 ducks, including one who harvested more than 50 ducks. Sometimes there are no whiskers because the minimum (or maximum) is the same as the lower (or upper) quartile (see Figure 3, where at least 25% of Licence Holders who hunted were unsuccessful).

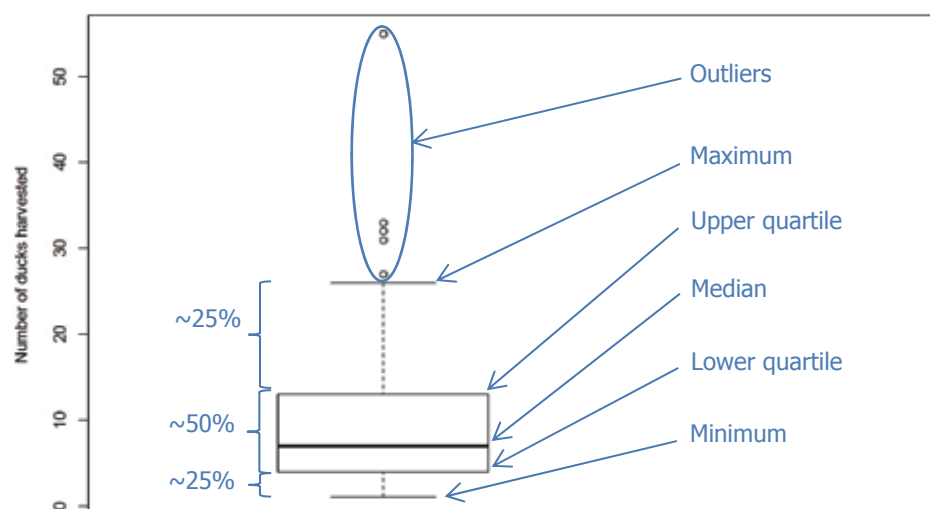


Figure A2.1: Example boxplot, with labels.

# Appendix 3

## Victorian Duck Hunting Survey

**Introduction:** Hi my name is \_\_\_\_\_ and I am calling about duck season on behalf of the Game Management Authority.

I was hoping you had time to answer a few quick questions.

( *use if asked to explain why* ) The survey of licensed Duck Hunters over the open season will provide information on hunting practices and harvest information as part of the continued process to improve game management in Victoria.

**Survey details:**

Date of interview: dd / mm / 2015

Non-responsive: ☐ ( *tick box* )

**Survey questions:**

1. Do you use a dog when you hunt ducks? Yes or No
2. Did you go duck hunting over the opening weekend?    Yes ☐    No ☐ ( *tick box, if 'Yes', proceed to question 3, if 'No' 'Thank you for taking part in this survey, if you would like to discuss or view the outcomes of this data, please contact Customer Service Centre on 136 186* )
3. How many Duck hunting trips did you take over the weekend?     ( *indicate number in box* )

(Each trip needs to be treated separately for question 4 - 8)

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
4. How many days did you go hunting?	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
5. How many ducks did you harvest?	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
6. What species were the duck?  <b>Include number of each species</b>	Black duck	Black duck	Black duck	Black duck	Black duck	Black duck
	Wood duck	Wood duck	Wood duck	Wood duck	Wood duck	Wood duck
	Mountain duck	Mountain duck	Mountain duck	Mountain duck	Mountain duck	Mountain duck
	Grey Teal	Grey Teal	Grey Teal	Grey Teal	Grey Teal	Grey Teal
	Chestnut Teal	Chestnut Teal	Chestnut Teal	Chestnut Teal	Chestnut Teal	Chestnut Teal
	Pink Ear	Pink Ear	Pink Ear	Pink Ear	Pink Ear	Pink Ear
	Shoveler	Shoveler	Shoveler	Shoveler	Shoveler	Shoveler
7. What type of land did you hunt on? "Can register more than one choice"	Hardhead	Hardhead	Hardhead	Hardhead	Hardhead	Hardhead
	State Game Reserve Private land Public land	State Game Reserve Private land Public land	State Game Reserve Private land Public land	State Game Reserve Private land Public land	State Game Reserve Private land Public land	State Game Reserve Private land Public land
8. What was the closest major town to the area you hunted?	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Thank you for your time

## Victorian Quail Hunting Survey

**Introduction:** Hi my name is \_\_\_\_\_ and I am calling about Stubble Quail season on behalf of the Game Management Authority. I was hoping you had time to answer a few quick questions.

( *use if asked to explain why* ) The survey of licensed Quail Hunters over the open season will provide information on hunting practices and harvest information as part of the continued process to improve game management in Victoria.

### Survey details:

Period of Survey \_\_\_\_\_ (1 to 3)      Date of interview: dd / mm / 2015

Non-responsive: ☐ (tick box)

### Survey questions:

1. Do you use a dog when you hunt for quail?      Yes ☐      No ☐
2. Did you go hunting on the opening Saturday?      Yes ☐      No ☐ (tick box)       (if 'Yes') (Indicate number of quail taken in box)
3. Did you go hunting on the opening Sunday?      Yes ☐      No ☐ (tick box)       (if 'Yes') (Indicate number of quail taken in box)
4. Have you been Quail hunting last month. ( name month )      Yes ☐      No ☐ (tick box, if 'Yes', proceed to question 5, if 'No' "Thank you for taking part in this survey, if you would like to discuss or view the outcomes of this data, please contact Customer Service Centre on 136 186)
5. How many Quail hunting trips did you take last month?       (indicate number in box)

(Each trip needs to be treated separately for question 6 - 10)



	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
6. How many days did you go hunting?	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
7. How many Quail did your harvest?	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
8. What type of land did you hunt on? "Can register more than one choice"	State Game Reserve Private land Public land	State Game Reserve Private land Public land	State Game Reserve Private land Public land	State Game Reserve Private land Public land	State Game Reserve Private land Public land	State Game Reserve Private land Public land
9. What type of grasslands was the hunt on? "Can register more than one choice"	Stubble Native Grass Introduced grass	Stubble Native Grass Introduced grass	Stubble Native Grass Introduced grass	Stubble Native Grass Introduced grass	Stubble Native Grass Introduced grass	Stubble Native Grass Introduced grass
10. What was the closest major town to the area you hunted?	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

**Thank you for your time**

