



Estimates of harvest for duck and quail in Victoria

Results from surveys of Victorian Game Licence holders in 2015

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

Paul D. Moloney and John D. Turnbull

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

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.

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 ≥ 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).

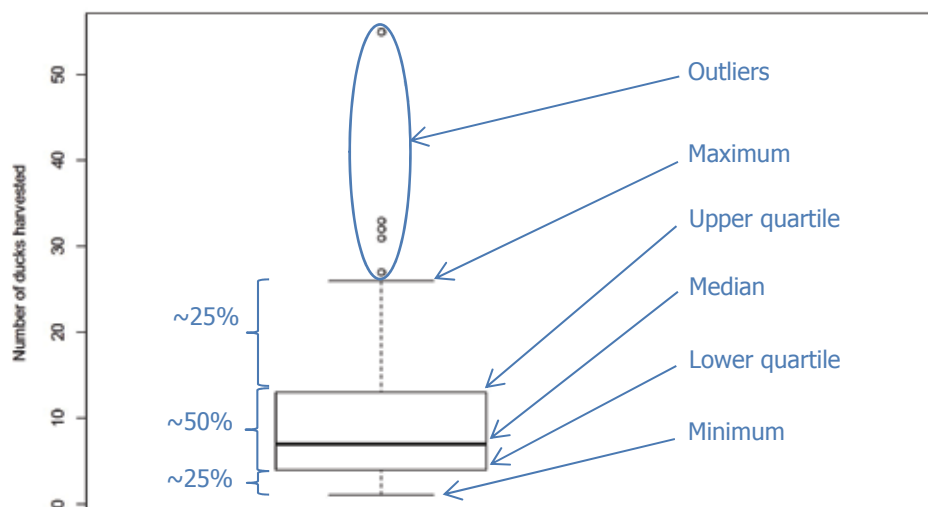


Figure A2.1: Example boxplot, with labels.

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?	Black duck Wood duck Mountain duck	Black duck Wood duck Mountain duck	Black duck Wood duck Mountain duck	Black duck Wood duck Mountain duck	Black duck Wood duck Mountain duck	Black duck Wood duck Mountain duck
Include number of each species	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
	Hardhead	Hardhead	Hardhead	Hardhead	Hardhead	Hardhead
7. 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
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

	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

