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Results from surveys of Victorian Game Licence holders in 2019

P.D. Moloney, J.O. Hampton

Game Management Authority

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Acknowledgment

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it. We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

We are committed to genuinely partner, and meaningfully engage, with Victoria's Traditional Owners and Aboriginal communities to support the protection of Country, the maintenance of spiritual and cultural practices and their broader aspirations in the 21st century and beyond.

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Results from surveys of Victorian Game Licence holders in 2019

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Context:

To effectively manage game species, it is important to quantify the numbers harvested. To ascertain levels of deer harvested, since 2009, Victorian State Government game management agencies have commissioned a series of regular telephone surveys of randomly selected Game Licence holders endorsed to hunt deer during the game harvest season. Additional telephone surveys were commissioned, starting in 2018, to quantify the scale of hunting deer with scent-trailing hounds This report focuses on the total deer harvests in for 2019 and specifically from scent-trailing hounds.

Aims:

The aim of this report is to provide estimates of the total harvest of deer by Victorian hunters during the 2019 hunting season.

Methods:

Game Licence holders endorsed to hunt deer and Game Licence holders endorsed to hunt Sambar Deer using scent-trailing hounds were randomly sampled and interviewed by telephone at intervals during their respective game seasons. In all surveys, respondents were asked whether they had hunted during the period for which the survey applied, and (if applicable) the number and species of deer harvested. Additional information was obtained on hunting methods and locations. Surveys at the end of the season were used to quantify the proportion of Game Licence holders who hunted at some stage of the season.

Results:

The total estimated deer harvest in 2019 was 173,800 (95% confidence interval (CI) = 141,400–213,500) and was 43% greater than 2018, which was the previous high-point and was almost double the average since 2009 (77,000). The increase in deer harvest could be explained by an increased number of hunting days per Game Licence holder. The number of hunting days per Game Licence holder endorsed to hunt deer increased by 45% from 2018 to 2019. Hunter efficiency (0.5 deer per hunting day) remained higher than the average since 2009.

In 2019, 60% of Game Licence holders endorsed to hunt deer where active deer hunters (hunted at least once). On average, active deer hunters harvested 6.8 deer over 13.6 days.

The most commonly harvested species was Sambar Deer (with an estimated total harvest of 131,300 or 76% of the harvest), followed by Fallow Deer (30,300 or 17%). It should also be noted that the increase in total deer harvest in 2019 was almost exclusively attributed to an increased Sambar Deer harvest.

In 2019 it is estimated that the total number of deer harvested using hounds was 24,900 (95% CI = 21,900–28,200). The average annual deer harvest rate using hounds per active Licence holder endorsed to hunt Sambar Deer with hounds was 10.5 (95% CI = 8.6–12.8), which is greater than the general rate per active hunter (6.8). The efficiency of deer harvest using hounds (0.45 deer per hunting day) is slightly less than the general efficiency (0.5) in 2019.

Conclusions and implications:

1. The 2019 deer hunting season continued the trend of increased annual harvest, compared with the previous survey years.
    - The number of deer harvested increased by 43% from the previous year.
    - The number of deer hunting days increased by 45% from the previous year.
    - The number of deer harvested using hounds increased by 70% from the previous year.
    - The number of deer hunting days using hounds increased by 51% from the previous year.
2. Performing telephone surveys throughout the year is likely to minimise memory bias and non-response bias. However, sources of bias will remain (due to over- and under-reporting), and the estimates of total harvest must be interpreted with care.

1 Introduction

To effectively manage game species, it is important to quantify the number of animals harvested. Since 2009, the Victorian State Government and its game management agencies have commissioned a series of regular telephone surveys of randomly selected Game Licence holders to estimate harvest levels of game species. Three sets of telephone surveys were conducted during the various game harvest seasons for deer, duck and quail, respectively. Since 2018, a secondary survey was conducted for Game Licence holders endorsed to hunt deer with scent-trailing hounds to quantify the level of hunting using hounds. This report focuses only on the deer harvests.

Deer hunting occurs all year round in Victoria for some species (Game Management Authority, 2018). The 2019 deer hunting reporting periods were defined by the calendar year. Sambar Deer (*Cervus unicolor*) can be hunted all year by stalking. Use of scent-trailing hounds is restricted to hunting Sambar Deer between 1 April and 30 November. There is no limit on the number of Sambar Deer that can be taken. Hog Deer (*Axis porcinus*) can only be hunted during April (excluding out of season ballot hunting) and is subject to additional restrictions, such as one male and one female per hunter. All other species can be hunted all year with no bag limit, including: Fallow Deer (*Dama dama*), Red Deer (*Cervus elaphus*), Chital Deer (*Axis axis*) and Rusa Deer (*Rusa timorensis*). As of 2019, Chital Deer and Rusa Deer have no wild populations in Victoria.

The survey methods employed here are the same as those used in the telephone surveys conducted during 2018 deer hunting season (Moloney & Powell, 2019) and similar to the 2009–2018 deer hunting seasons (Gormley & Turnbull, 2009, 2010, 2011; Moloney & Turnbull, 2012, 2013, 2014, 2016, 2017, 2018).

2 Methods

All surveys were conducted by the telephone survey company Marketing Skill Pty Ltd (Mt Eliza, Victoria) on behalf of the Game Management Authority. Estimates of total harvest by Game Licence holders were based on the hunting activities reported by the survey respondents.

2.1 Holders of a Game Licence endorsed for hunting deer

A telephone survey was conducted every two months, involving 200 respondents [1] from a random sample of holders of a Game Licence endorsed for hunting deer (hereafter referred to as 'Game Licence holders'). Respondents were asked to report their hunting activities for that period, including the number and sex of each species harvested. The answers only covered the period (i.e. two months) of that survey. Therefore, although a respondent 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. During each survey, the 200 respondents were interviewed, regardless of whether they had hunted or not. An additional random sample of 400 Game Licence holders endorsed to hunt deer were surveyed immediately after the conclusion of the 2019 hunting season (i.e. the end of the calendar year). They were asked if they had hunted at any stage during the season. The number of active hunters was estimated using the survey question in the final survey on whether they had hunted at any stage during 2019.

The information from the respondents was used to generate an estimate for the whole population of Game Licence holders for deer. Estimates of harvest were determined for each of the survey periods and were summed to give an estimate of the total season harvest.

[1] Respondent refers to a Game Licence holder who was contacted and agreed to take part in the survey.

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 for that period, yielding the estimated total number of hunters for that survey period.

For each survey period, the average harvest per hunter[2] 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 annual harvest per Game Licence holder endorsed to hunt deer 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 that hunted. The sum of these estimates across the year provided an estimate of the annual harvest per Game Licence holder endorsed to hunt deer.

Respondents who hunted were also asked to provide information on whether hunting was conducted on private land or public land, the name of the town nearest to where they hunted, what hunting methods they had used (i.e. stalking, scent-trailing hounds, or gun dogs), 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.

Examples of the questionnaires used are given in Appendix A and B. Additional details of the methods, as well as examples of the calculations, are provided in Appendix C. Information describing and interpreting boxplots is provided in Appendix D. Since 2017, an end of year survey has been conducted that allow for estimates to be given per active hunter. Prior to that, estimates needed to be per Game Licence holder, whether they hunted or not. Hence, for consistency with surveys prior to 2017, estimates of average deer harvest and hunting days per Game Licence holders is given in Appendix E.

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

2.2 Holders of a Game Licence endorsed for hunting Sambar Deer using hounds

A telephone survey was conducted every two months during the hound hunting season, involving 100 respondents from a random sample of holders of a Game Licence endorsed for hunting deer using scent-trailing hounds (hereafter referred to as 'Game Licence holders using hounds'). Respondents were asked to report their hunting activities for that period, including the number and sex of each species harvested, if hounds were used and team size. The answers only covered the period (i.e. two months) of that survey. Therefore, although a respondent 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. During each survey, the 100 respondents were interviewed, regardless of whether they had hunted or not. An additional random sample of 400 Game Licence holders using hounds were surveyed immediately after the conclusion of the 2019 hound hunting season. They were asked if they had hunted at any stage during the hound season and this information used to estimate the number of active hound hunters that hunted at any stage during 2019.

The analysis of the information given by the hound hunting respondents was used in a similar way to the general Game Licence holders. However, instead of using the harvest total for the respondent for the period, the total of the harvest per team member across trips was used. For example, let us imagine a respondent who went hunting twice. The first team had 4 hunters that harvested 1 deer in total, for 0.25 deer per team member (1÷4=0.25). The second team had 6 hunters that harvested 3 deer in total, for 0.5 deer per team member (3÷6=0.5). Therefore, the total harvest per team member for this respondent would be 0.75 (0.25 + 0.5) deer per team member. Using this formulation allows for the estimate to be scaled up by the number of Game Licence holders using hounds for an estimate of the total Sambar Deer harvest where hounds were used. Information related to team size, non-hound hunting harvest (i.e. deer taken by stalking) and other statistics were also calculated.

3 Results

3.1 Overall deer harvest in 2019

The number of Game Licence holders endorsed to hunt deer increased throughout every two-month period of 2019, from 35,038 in January–February to 41,985 in November–December (Table 1). To achieve the required sample size of respondents, slightly more than 200 Game Licence holders were contacted each survey, with an average of 99% of those contacted being willing to take part.

The proportion of Game Licence holders who hunted in each survey period varied throughout the season: roughly 44% of licence holders hunted in July–August; less than 15% of licence holders hunted in January–February (Table 2). The proportion who hunted during other survey periods was between 22% to 34% (Table 2).

Table 1. Summary of responses for deer surveys in 2019.

Deer survey	Period	Licence holders	Respondents	Respondents who hunted	Days hunted [3]	Deer harvested [4]
1	Jan-Feb	35,038	200	29	168	97
2	Mar-Apr	36,568	200	69	310	137
3	May-Jun	38,253	200	63	370	220
4	Jul-Aug	39,735	200	88	476	245
5	Sep-Oct	41,329	200	52	272	112
6	Nov-Dec	41,985	200	44	176	85

Table 2. Proportion and corresponding total number of deer licence holders who hunted in each survey period in 2019.

Period	Proportion	SE	95% CI		Total hunters	SE	95% CI	
			Lower	Upper			Lower	Upper
Jan–Feb	0.14	0.025	0.10	0.20	5,081	872	3,638	7,096
Mar–Apr	0.34	0.034	0.29	0.42	12,616	1,229	10,428	15,264
May–Jun	0.32	0.033	0.26	0.39	12,050	1,256	9,828	14,774
Jul–Aug	0.44	0.035	0.38	0.51	17,483	1,395	14,956	20,437
Sep–Oct	0.26	0.031	0.21	0.33	10,746	1,282	8,512	13,565
Nov–Dec	0.22	0.029	0.17	0.29	9,237	1,230	7,123	11,977

Within each survey period, there was great variation in the reported harvest of deer per hunter (i.e. per Game Licence holder who hunted). Some hunters harvested more than 10 deer in a survey period, whereas at least one-quarter did not harvest any deer in each period (Figure 1). The median number of deer harvested per hunter in a two-month period was one. The average number of deer per hunter varied throughout the season (Table 3). The mean harvest per hunter in 2019 ranged from a low of 1.93 in November–December to a high of 3.49 deer in May–June.

[3] Days hunted indicates the combined number of days on which deer hunting took place by respondents.

[4] Deer harvested indicates total number of deer harvested by respondents.

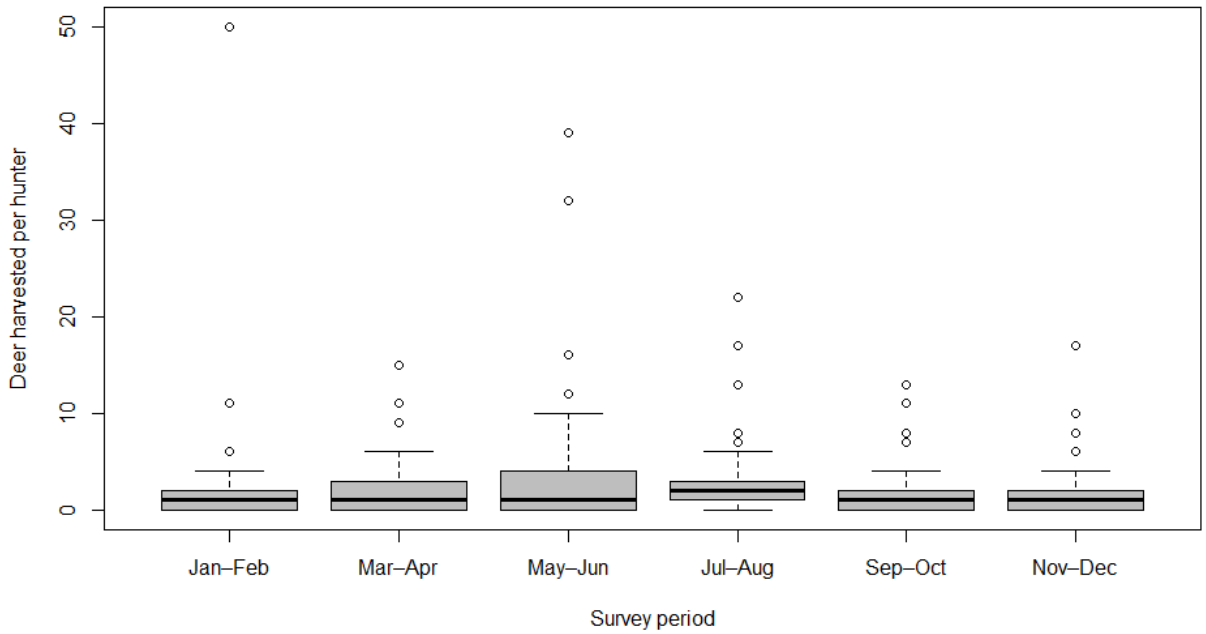

Figure 1. Boxplot of the number of deer reported harvested by individual hunters for each survey period in 2019.

The bottom and top of each 'box' indicate the 25th and 75th percentiles, respectively, with the black horizontal line indicating the median (50th percentile) reported value.

Table 3. Mean harvest of deer per hunter (Game Licence holders who hunted) for each survey period in 2019.

Period	Average harvest per hunter [5]	SE	95% CI	
			Lower	Upper
Jan–Feb	3.34	1.72	1.29	8.66
Mar–Apr	1.99	0.33	1.44	2.74
May–Jun	3.49	0.84	2.19	5.56
Jul–Aug	2.78	0.38	2.13	3.63
Sep–Oct	2.15	0.34	1.59	2.92
Nov–Dec	1.93	0.48	1.19	3.13

There was an estimated total of 173,784 deer harvested from January 2019 to December 2019, inclusive, by Game Licence holders endorsed to hunt deer (95% CI = 141,431–213,538; Table 4). Harvest was greatest in the autumn to winter months and lowest in the summer months.

Using a telephone survey immediately after the 2019 deer season ended, it was estimated that 60% (95% CI = 56%–65%) of Game Licence holders actually hunted for deer during 2019 (Table 5). That equates to an estimate of 25,401 (95% CI = 23,468–27,493) active deer hunters [6] in 2019. The average annual deer harvested per active deer hunter was estimated to be 6.8 (95% CI = 5.5–8.5). The average annual hunting days per active deer hunter was estimated to be 13.6 (95% CI = 11.5–16). The annual average harvest is lower than the sum of each period (Table 3), as not all active hunters hunt in each period.

[5] Average harvest per hunter = Deer harvested divided by Respondents who hunted (Table 1).

[6] Active deer hunters are Game Licence holders endorsed to hunt deer that have hunted at least once this season.

Table 4. Estimates of the total deer harvest in Victoria in 2019 by holders of a deer Game Licence.

Period	Total harvest[7]	SE	95% CI	
			Lower	Upper
Jan–Feb	16,993	9,231	6,273	46,037
Mar–Apr	25,049	4,805	17,258	36,358
May–Jun	42,078	11,038	25,379	69,766
Jul–Aug	48,675	7,678	35,798	66,184
Sep–Oct	23,144	4,558	15,791	33,922
Nov–Dec	17,844	5,061	10,345	30,779
Total	**173,784**	**18,316**	**141,431**	**213,538**

Table 5. Estimates of annual deer hunting in Victoria in 2019 by holders of a deer Game Licence who hunted at least once.

Statistic	Annual estimate	SE	95% CI	
			Lower	Upper
Proportion active	0.6	0.0	0.6	0.7
Estimated active hunters	25,401	1,026	23,468	27,493
Average harvest per active hunter	6.8	0.8	5.5	8.5
Average hunting days per active hunter	13.6	1.2	11.5	16.0

Separate harvest estimates for each deer species are presented in Figure 2 and Table 6. The most frequently harvested species was Sambar Deer, comprising 76% of the total reported harvest, followed by Fallow Deer (17%), Red Deer (2%). Hog Deer accounted for less than 1% of the reported deer harvest. No Chital Deer or Rusa Deer was reported harvested in the 2019 telephone survey. Even though only one survey respondent reported harvesting Hog Deer in 2019, a total of 116 Hog Deer (90 stags and 26 hinds) were taken on the mainland and recorded at checking stations, with an additional 28 Hog Deer (26 stags and 2 hinds) harvested on Snake Island, and 53 Hog Deer (24 stags and 29 hinds) harvested on Sunday Island (which is managed by a private cooperative).

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

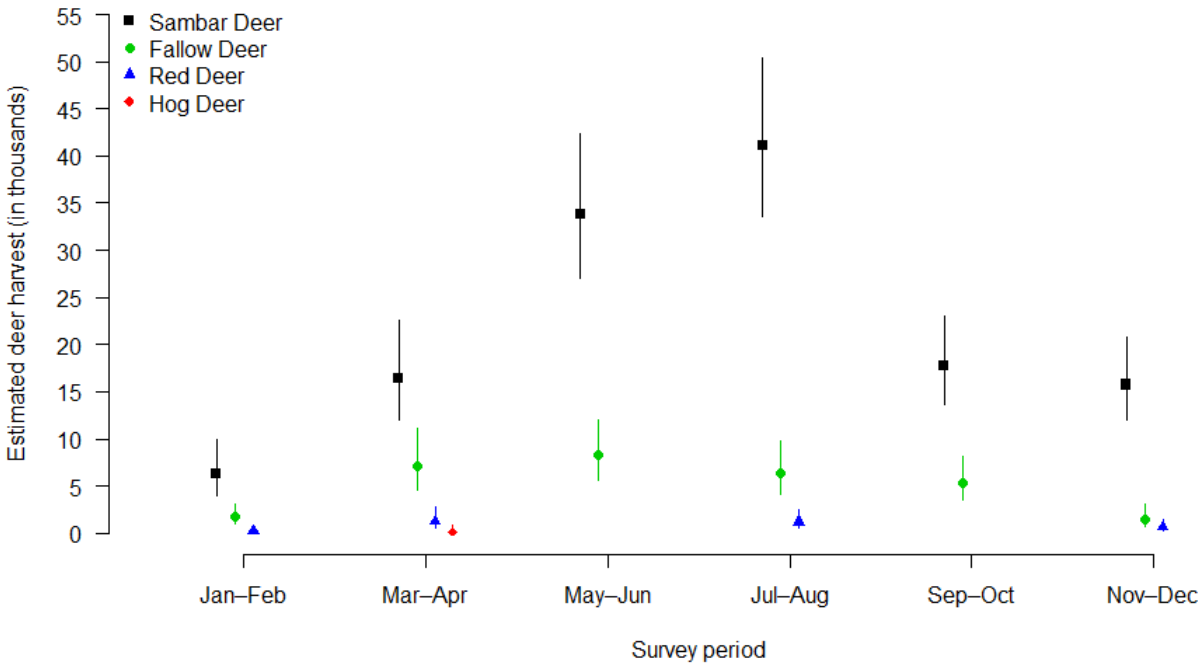

Figure 2. Estimated total deer harvest for each two-month survey period in 2019 by species.

Vertical bars indicate 95% confidence intervals. Species were only included in surveys periods when they were reported.

Table 6. Estimates of the total harvest per deer species for each survey period in 2019

a. Sambar Deer.

Period	Reported harvest	Estimated harvest	SE	95% CI	
				Lower	Upper
Jan–Feb	36	6,307	1,499	3,983	9,987
Mar–Apr	90	16,456	2,677	11,987	22,589
May–Jun	177	33,854	3,900	27,031	42,398
Jul–Aug	207	41,126	4,282	33,553	50,408
Sep–Oct	86	17,771	2,381	13,684	23,080
Nov–Dec	75	15,744	2,218	11,962	20,722
Total	**671**	**131,258**	**7,317**	**117,681**	**146,401**

b. Fallow Deer

Period	Reported harvest	Estimated harvest	SE	95% CI	
				Lower	Upper
Jan–Feb	10	1,752	530	981	3,129
Mar–Apr	39	7,131	1,650	4,557	11,157
May–Jun	43	8,224	1,627	5,602	12,074
Jul–Aug	32	6,358	1,409	4,139	9,765
Sep–Oct	26	5,373	1,178	3,513	8,217
Nov–Dec	7	1,469	572	703	3,070
Total	**157**	**30,307**	**3,058**	**24,881**	**36,916**

c. Red Deer

Period	Reported harvest	Estimated harvest	SE	95% CI	
				Lower	Upper
Jan–Feb	1	175	165	37	833
Mar–Apr	7	1,280	513	600	2,728
May–Jun	0	0	NA	NA	NA
Jul–Aug	6	1,192	452	582	2,443
Sep–Oct	0	0	NA	NA	NA
Nov–Dec	3	630	296	262	1,512
Total	**17**	**3,277**	**763**	**2,089**	**5,141**

d. Hog Deer

Period	Reported harvest	Estimated harvest	SE	95% CI	
				Lower	Upper
Jan–Feb	0	0	NA	NA	NA
Mar–Apr	1	183	172	38	869
May–Jun	0	0	NA	NA	NA
Jul–Aug	0	0	NA	NA	NA
Sep–Oct	0	0	NA	NA	NA
Nov–Dec	0	0	NA	NA	NA
Total	**1**	**183**	**172**	**38**	**869**

There was a statistically significant sex bias favouring females for the harvest of Sambar Deer and Fallow Deer (Table 7). There was no statistically significant sex bias for the harvest of Red Deer or Hog Deer.

The number of days hunted in each survey period varied throughout the season, with most hunting occurring from late autumn to mid-spring. Each Game Licence holder endorsed to hunt deer who was active hunted an average of 13.6 days during 2019, corresponding to a total of 344,604 hunter days (95% CI = 297,594–399,039; Table 8).

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Table 7. Reported numbers and proportions of each deer species by sex harvested in 2019.

Species	Males			Females		
	Reported	%	SE	Reported	%	SE
Sambar Deer	267	0.40	0.02	404	0.60	0.02
Fallow Deer	60	0.38	0.04	97	0.62	0.04
Red Deer	10	0.59	0.12	7	0.41	0.12
Hog Deer	0	0	NA	1		NA

Table 8. Number of days deer were hunted by Game Licence holders in 2019.

Period	Days hunted per Game Licence holder	SE	95% CI	
			Lower	Upper
Jan–Feb	29,432	9,238	16,139	53,672
Mar–Apr	56,680	9,004	41,596	77,236
May–Jun	70,768	13,221	49,223	101,743
Jul–Aug	94,569	12,815	72,598	123,189
Sep–Oct	56,207	9,932	39,860	79,260
Nov–Dec	36,947	7,918	24,389	55,970
Total hunting days	**344,604**	**25,822**	**297,594**	**399,039**

More deer hunting occurred exclusively on public land (63%) compared with exclusively on private land (26%), with correspondingly similar proportions of deer harvested (Table 9). Most Sambar Deer were harvested on public land (69%). Most Fallow Deer were harvested on private land only (50%).

Table 9. Percentage of the total hunting days and deer harvest by species and land tenure in 2019.

Land tenure	Days	Total Deer harvest	Sambar Deer harvest	Fallow Deer harvest	Red Deer harvest	Hog Deer harvest
Private land only	25.8	32.5	23.1	50.3	41.2	0
Public land only	62.8	56.1	68.6	22.9	35.3	100
Both	8.1	10.8	8.0	24.8	23.5	0
Not specified	3.3	0.6	0.3	1.9	0.0	0

From the general surveys stalking was the preferred hunting method, being used on 79.9% of the hunting days and accounting for 75.4% of the reported harvest where that information was specified. If was estimated that hunting with scent-trailing hounds accounts for 22.5% of the total deer harvest (or 29.8% of Sambar Deer), but, only 10.1% of hunting days (Table 10).

Recorded use of gundogs was limited to under 1.5% of hunting days and deer harvest. It should be noted that on 44.4% hunting days respondents did not specify their hunting method. Most of these relate to days where hunting was unsuccessful. This uncertainty will affect the reliability of the percentage hunting days using each method.

Table 10: Percentage of the total hunting days and deer harvest by hunting method and land tenure in 2019.

Land tenure		Scent-trailing hounds	Stalking	Stalking with gundog	Not specified	Total
Private land only	Days	0.3	15.6	0.1	9.8	**25.8**
	Deer	0.3	31.9	0.2	0.0	**32.5**
Public land only	Days	9.6	24.8	1.1	27.3	**62.8**
	Deer	21.8	30.9	1.1	2.3	**56.1**
Both	Days	0.2	3.3	0.0	4.6	**8.1**
	Deer	0.4	9.9	0.0	0.4	**10.8**
Not specified	Days	0.0	0.6	0.0	2.7	**3.3**
	Deer	0.0	0.6	0.0	0.0	**0.6**
Total	**Days**	**10.1**	**44.4**	**1.2**	**44.4**	**100**
	Deer	**22.5**	**73.3**	**1.3**	**2.8**	**100**

Total harvest was estimated to be greatest in the North East CMA, followed by the East Gippsland CMA and the Goulburn Broken CMA (Figure 3). The top five towns for the total reported number of deer harvested were (in descending order) Myrtleford, Mansfield, Bairnsdale, Dargo and Whittlesea. The top five towns for the total number of reported deer hunting days were (in descending order) Mansfield, Dargo, Licola, Wodonga and Myrtleford.

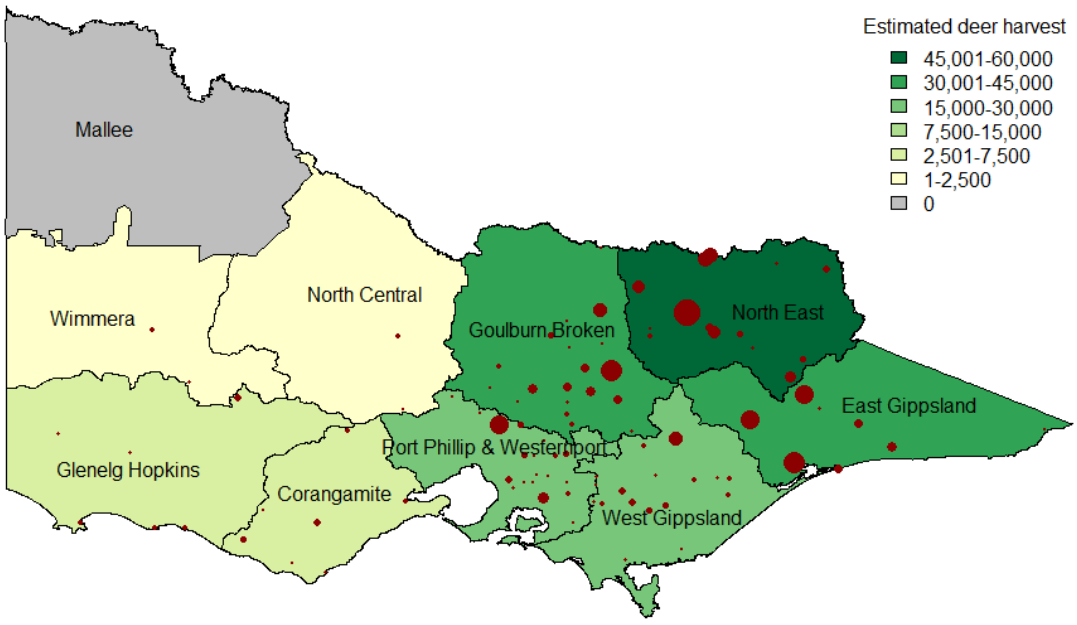

Figure 3. Estimates of total deer harvest in 2019 by CMA region.

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

3.2 Overall deer harvest using scent-trailing hounds in 2019

The number of Game Licence holders endorsed to hunt deer using scent-trailing hounds increased throughout 2019, from 4,836 in April to 5,190 at the end of the season (Table 10). To achieve the required sample size of respondents, slightly more than 100 licence holders were contacted each survey, with an average of 99% of those contacted being willing to take part.

The proportion of Game Licence holders endorsed to use scent-trailing hounds who hunted with hounds varied between surveys with the August–September period having a much greater proportion (54%) than other surveys (Table 11).

Table 11. Summary of responses from 2019 Game Licence holders endorsed to used scent-trailing hounds.

Deer survey	Period	Licence holders	Respondents	Respondents who hunted	Days hunted	Deer harvested [8]
1	Apr–May	4,836	100	36	291	780
2	Jun–Jul	5,030	101	39	297	848
3	Aug–Sep	5,142	99	53	347	842
4	Oct–Nov	5,190	100	29	153	556

Table 12. Proportion and corresponding total number of hound hunting licence holders who hunted with hounds in each survey period in 2019.

Period	Proportion	SE	95% CI		Total hunters	SE	95% CI	
			Lower	Upper			Lower	Upper
Apr–May	0.36	0.048	0.28	0.47	1,741	232	1,342	2,258
Jun–Jul	0.39	0.048	0.30	0.49	1,942	244	1,520	2,481
Aug–Sep	0.54	0.050	0.45	0.64	2,753	258	2,292	3,306
Oct–Nov	0.29	0.045	0.21	0.39	1,505	236	1,110	2,042

[8] Deer harvested indicates total number of deer harvested by the hound teams including the respondents.

Within each survey period, there was great variation in the reported harvest of deer per hunter's hound hunting teams (i.e. scent-trailing hound team total per Game Licence holder who hunted). Some teams (15%) harvested more than 40 deer in a survey period, whereas 10% harvested one deer or less in each period (Figure 4).

The median number of deer harvested per team in a two-month period was 12. The mean number of deer per team member varied throughout the season (Table 12). The mean harvest per hunter in a team in 2019 ranged from a low of 2.7 in August–September while all other periods were around a high of 3.5 deer.

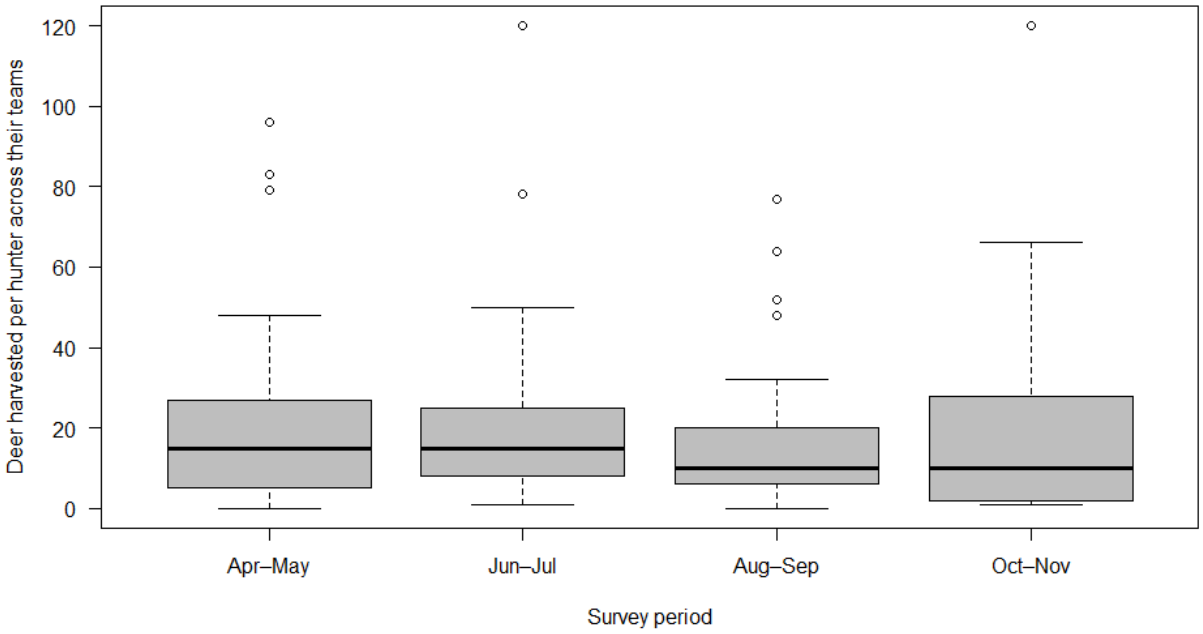

Figure 4. Boxplot of the number of deer reported harvested by scent-trailing hound teams for each survey period in 2019.

The bottom and top of each 'box' indicate the 25th and 75th percentiles, respectively, with the black horizontal line indicating the median (50th percentile) reported value.

Table 13. Average harvest of deer per team member (summed by hunter, i.e. Game Licence holders who hunted using scent-trailing hounds) for each survey period in 2019.

Period	Average harvest per hound hunter[9]	SE	95% CI	
			Lower	Upper
Apr–May	3.45	0.09	3.28	3.62
Jun–Jul	3.44	0.10	3.26	3.64
Aug–Sep	2.68	0.09	2.51	2.86
Oct–Nov	3.45	0.09	3.28	3.62

[9] Average harvest per hound hunter where the harvest per hunter is the sum of the deer harvested by team divided by team members for each team the respondent was involved.

There was an estimated total of 24,866 deer harvested from April 2019 to November 2019 inclusive, by Game Licence holders endorsed to hunt deer using scent-trailing hounds (95% CI = 21,920–28,208; Table 13). Harvest was greatest in the winter-early spring months and lowest in the later spring months. Using the responses from the telephone survey immediately after the 2019 deer hunting season using scent-trailing hounds ended, it was estimated that 46% (95% CI = 39%–53%) of Game Licence holders endorsed to use scent-trailing hounds actually hunted for deer during 2019 (Table 14). That equates to an estimate of 2,361 (95% CI = 2,030–2,748) active deer hunter using scent-trailing hounds [10] in 2019. The average deer harvest per active deer hunter using scent-trailing hounds was estimated to be 10.5 (95% CI = 8.6–12.8) during 2019.

Table 14. Estimates of the total deer harvest using scent-trailing hounds in Victoria in 2019 by holders of a deer Game Licence.

Period	Total harvest [11]	SE	95% CI	
			Lower	Upper
Apr–May	6,001	815	4,604	7,821
Jun–Jul	6,687	860	5,203	8,594
Aug–Sep	7,373	732	6,073	8,952
Oct–Nov	4,805	792	3,487	6,623
Total	**24,866**	**1,602**	**21,920**	**28,208**

Table 15. Estimates of annual deer hunting using scent-trailing hounds in Victoria in 2019 by holders of a deer Game Licence who hunted at least once.

Statistic	Annual estimate	SE	95% CI	
			Lower	Upper
Proportion active	0.46	0.04	0.39	0.53
Estimated active hunters	2,361	183	2,030	2,748
Average harvest per active hunter	10.53	1.06	8.65	12.82
Average hunting days per active hunter	23.22	2.63	18.61	28.97

[10] Active deer hunters using scent-trailing hounds are Game Licence holders endorsed to hunt deer using scent-trailing hounds that have hunted at least once this season.

[11] Total harvest = Harvest per hunter (Table 12) × Total hunters (Table 11). Numbers may differ slightly due to rounding of average harvest per hunter.

There was a statistically significant sex bias favouring female deer for the harvest of Sambar Deer using scent-trailing hounds (p-value < 0.0001). The proportion of the harvest that was female was 57% (95% CI = 55%–59%).

The average number of scent-trailing hound hunting days in each survey period varied throughout the season, with most hunting occurring from late-autumn to early-spring. The total number of scent-trailing hound deer hunting days was 54,828 during 2019 (Table 16).

Total harvest was estimated to be greatest within the permitted areas of the North East CMA, followed by the Goulburn Broken CMA and the East Gippsland CMA (Figure 5). The top five towns for the total reported number of deer harvested were (in descending order) Myrtleford, Mansfield, Bairnsdale, Dargo and Whittlesea. The top five towns for the total number of reported deer hunting days were (in descending order) Mansfield, Dargo, Licola, Wodonga and Myrtleford.

Table 16. Total number of days teams hunted using scent-trailing hounds in 2019 by survey period.

Period	Days hunted	SE	95% CI	
			Lower	Upper
Apr–May	14,073	3,090	9,198	21,531
Jun–Jul	14,791	3,099	9,853	22,205
Aug–Sep	18,023	3,151	12,827	25,324
Oct–Nov	7,941	2,151	4,714	13,377
Total scent-trailing hound hunting days	**54,828**	**5,806**	**44,577**	**67,435**

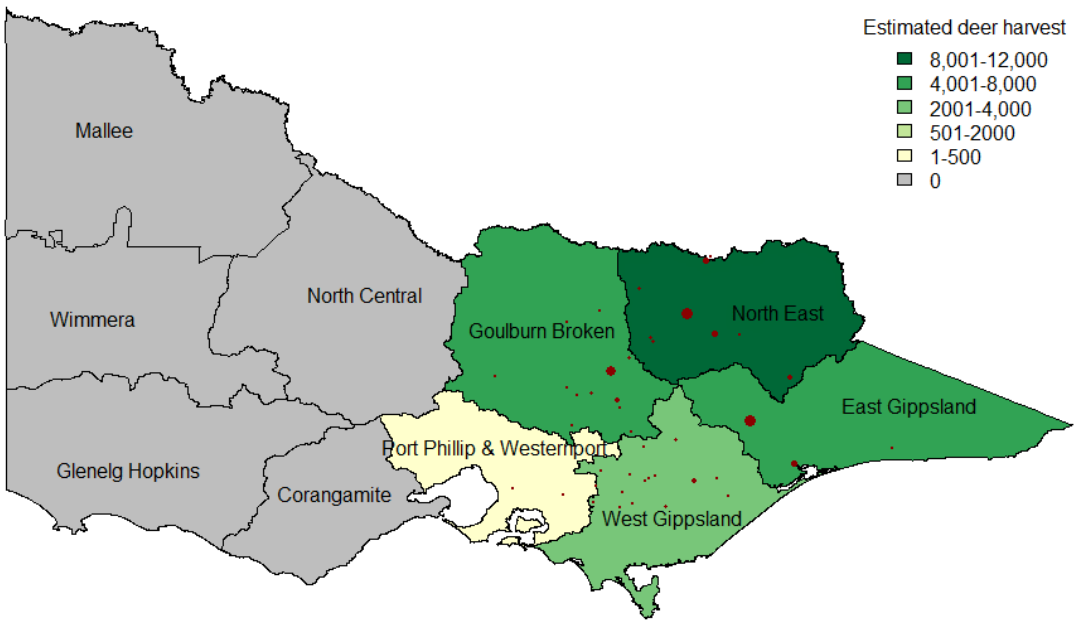

Figure 5. Estimates of total deer harvest using scent-trailing hounds in 2019 by CMA region.

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

4 Discussion

4.1 Deer harvest in 2019

A total of 173,784 deer were estimated to have been harvested in Victoria during the 2019 calendar year (95% CI = 141,431–213,538).

The deer harvest was the largest on record (Table 16, Figure 6). Based on the responses of the Game Licence holders surveyed, the 2019 estimate was 126% larger than the average harvest, and 43% larger than the next highest estimated deer harvest (2018).

The most commonly harvested species in 2019 was Sambar Deer (131,258), followed by Fallow Deer (30,307), Red Deer (3,277) and Hog Deer (183). There were no Chital Deer or Rusa Deer reported harvested by surveyed Game Licence holders in 2019. In addition to the one survey respondent who reported harvesting Hog Deer in 2019, a total of 119 Hog Deer were recorded at mainland checking stations, an additional 28 Hog Deer harvested on Snake Island, and 53 Hog Deer harvested on Sunday Island (which is managed by a private cooperative).

The 2019 season had the largest number of hunting days since surveys began, 80% greater than average. The number of hunting days is largest from autumn to mid-spring. The average number of hunting days per Game Licence holder[12] was in line with the long-term average. Note that Game Licence holder is used as the denominator to be consistency with previous years. Prior to 2017 (when the end of year survey was started), averages could only be calculated in terms of Game Licence holders.

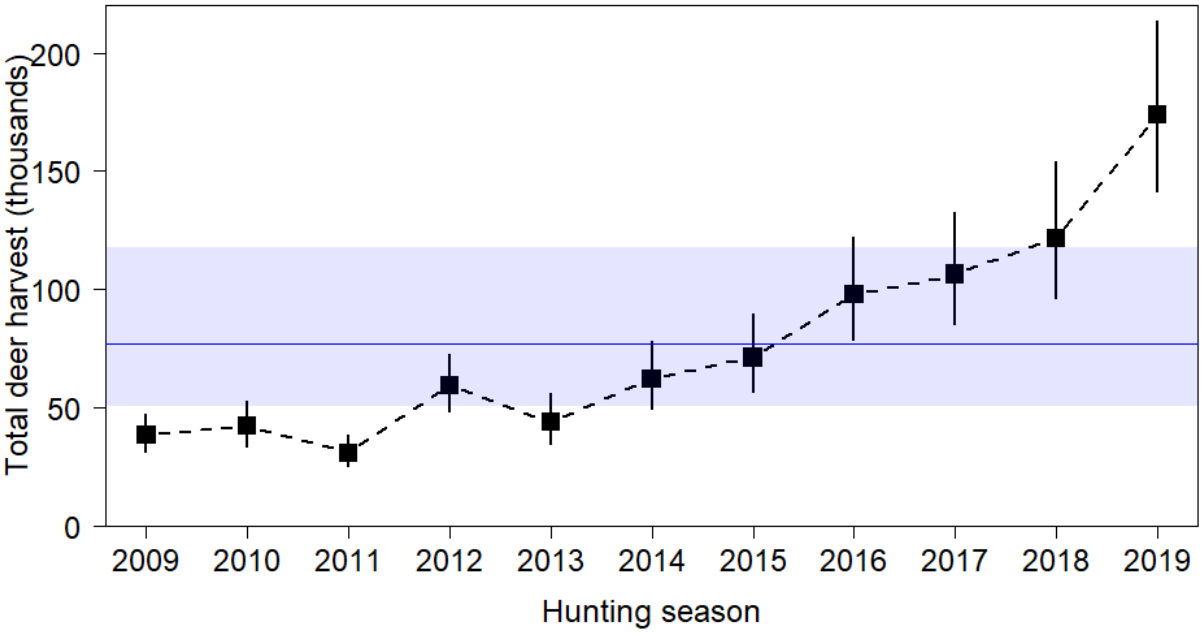

Figure 6. Estimates of total deer harvests (in thousands) from 2009 to 2019.
The square is the estimated total harvest for each season; the solid vertical line indicates the 95% confidence interval; the blue line is the average deer harvest from 2009 to 2019; the shaded area is the 95% confidence interval for the average deer harvest from 2009 to 2019.

[12] Game Licence holders mean people who have a Game Licence endorsed to hunt deer and potentially did not hunt deer in 2019.

The average number of deer harvested per Game Licence holder in 2019 was 4.5 (Table 17), the largest recorded, 71% greater than average and 28% more than the next highest year (2018). The efficiency of hunters in 2019 was 0.5 deer harvested per hunting day. That was the third highest efficiency on record, 37% greater than the average.

From 2009 to 2019, the average increase in deer harvested was 16% per year. The increase in total number of hunting days was 7% per year. Thus, the increase in the quantity of deer harvested was larger than the increase in hunting days, which means that hunter efficiency has also been increasing (by 9% per year on average).

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

Table 17. Comparison of Deer harvests of 2009 to 2019 [13].

Year	Chital Deer	Fallow Deer	Hog Deer	Red Deer	Sambar Deer	Total harvest	Total hunting days	Deer per licence holder	Hunting days per licence	Deer per hunting day
2009	0	4,871	81	682	32,453	38,284	150,321	2.14	8.38	0.25
2010	0	6,085	454	1,396	34,108	42,133	149,002	2.12	7.56	0.28
2011	0	4,001	105	737	25,913	30,753	135,278	1.43	6.30	0.23
2012	0	9,788	102	555	48,048	59,206	169,721	2.62	7.54	0.35
2013	0	6,426	0	926	36,355	43,985	135,854	1.76	5.47	0.32
2014	0	7,870	0	745	51,390	62,166	186,215	2.22	6.68	0.33
2015	0	14,488	138	939	55,094	71,141	201,547	2.36	6.77	0.35
2016	129	15,059	0	1,713	80,875	97,776	207,614	3.12	6.63	0.47
2017	181	15,515	154	1,609	88,816	106,275	184,317	3.11	5.45	0.58
2018	0	30,552	0	2,101	88,202	121,567	237,594	3.49	6.71	0.51
2019	0	30,307	183	3,277	131,258	173,784	344,604	4.48	8.86	0.50
Average	**28**	**13,178**	**111**	**1,335**	**61,137**	**77,006**	**191,097**	**2.62**	**6.94**	**0.38**

[13] Deer and hunting days per licence holder is used here so that it can be compared to surveys prior to 2017 when the deer and hunting days per active hunter could be calculated.

4.2 Deer harvest using scent-trailing hounds in 2019

A total of 24,866 deer were estimated to have been harvested using scent-trailing hounds in Victoria during the 2019 calendar year (95% CI = 21,920–28,208).

The 2019 deer harvest using scent-trailing hounds was 70% larger than the 2018 harvest (Table 17), the only other year surveyed using this survey method. Similarly, the total number of days spent hunting with scent-trailing hounds increased by 51%. The efficiency increased from 2018 to 2019 by 0.05 deer harvested per day spent hunting with scent-trailing hounds.

It should be noted that the survey of Game Licence holders endorsed to hunt deer using scent-trailing hounds were also asked about any stalking they did during the same period. The responses showed that similar proportions stalked (40%) and hound hunted (39%), while 17% did both within the two-month period. Responses also showed that while stalking, hunters harvested similar amounts of deer (1.20 per hunter versus 1.23 per team member) over the same time period. Game Licence holders endorsed to hunt deer using scent-trailing hounds spent an average of 4.63 days hunting deer combining use of scent-trailing hounds (2.72 days) and stalking (1.91 days).

In 2019, Game Licence holders endorsed to hunt deer using scent-trailing hounds were slightly less efficient when using scent-trailing hounds compared to deer hunters in general. When using scent-trailing hounds their efficiency was 0.45 deer harvested per team member per hunting day. For the general Game Licence holder endorsed to hunt deer, the efficiency was 0.5 deer harvested per hunting day (12% larger). However, an average Game Licence holder endorsed to hunt deer using scent-trailing hounds was more efficient when they were stalking (0.63 deer per day) than when using scent-trailing hounds or Game Licence holders in general.

If someone hunted in one survey period they must have hunted at some stage during the season, so the annual participation rate should be at least as large as the participation rate in any two-month survey. Hence, it should be noted that the proportion of Game Licence holders endorsed to use scent-trailing hounds that actually hunted for deer during 2019 as estimated from the end-of-year survey (46%) was lower than the August–September survey of 54%. This discrepancy could be due to the nature of surveys sampling a group that under-represented the proportion of hunters in the end of year survey or over-represented the proportion of hunters in the August-September survey or a combination of both. The percentage of Game Licence holders endorsed to use scent-trailing hounds that actually hunted for deer during 2018 (52%, 95% CI = 45–59%, Table 18) was greater than 2019 (46%, 95% CI = 39–53%). Add to this that the proportion of active hunters in each survey period was greater in 2019 than 2018, it would seem that the estimate from 2019 is an under-estimate of the true proportion. Therefore, the estimate of active hunters using scent-trailing hounds would also be an under-estimate, while the harvest per active hunter using scent-trailing hounds would be an over-estimate. If we used the proportion of active hunters using scent-trailing hounds in August-September 2019 (54%) there would be an estimated 2,778 active hunters with an average harvest of 8.9 Sambar Deer.

Table 18: Comparison of deer harvests using scent-trailing hounds from 2018 to 2019.

Year	Proportion of active hunters	Total harvest	Total hunting days	Deer per active hunter	Hunting days per active hunter	Deer per hunting day
2018	0.52	14,670	36,416	5.69	14.14	0.40
2019	0.46	24,866	54,828	10.53	23.22	0.45
Average	**0.49**	**19,768**	**45,622**	**8.11**	**18.68**	**0.43**

4.3 Assumptions

The estimates of the harvest for each deer species were derived based on the assumption that the samples of respondents were representative of the entire population of Victorian Game Licence holders endorsed to hunt deer. 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). Any 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-month period would have ensured that both memory bias and non-response bias were kept low (compared with postal surveys and complete end-of-season surveys) (Barker, 1991; Barker, Geissler, & Hoover, 1992). Nevertheless, some bias likely remains, and the estimates of total harvest should be interpreted with care.

It is important to note that the methodology explicitly accounts for the possibility that not every Game Licence holder actively hunts in every survey period (see Gormley & 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 active 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 4). For example, within a given survey period, some respondents indicated that they hunted unsuccessfully, whereas others took multiple trips and indicated a total harvest of more than five deer during the same period. The second source of uncertainty was due to sampling 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 deer. Statistically, these sample sizes are considered adequate to provide reasonably precise estimates.

The spatial distribution of the deer harvest should also be interpreted with care. Grouping the harvest by 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 be 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.

The analysis of Sambar Deer harvested using scent-trailing hounds required an assumption that the respondents were independent within a survey period. That is, the respondents within a survey were not part of the same team during that survey period. If they were, then there is a potential that we double counted that harvest, increasing the average harvest rate.

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Appendix A

Questionnaire for Game Licence holder endorsed to hunt deer

1. What is the main species of deer do you hunt? Sambar/Fallow/Red/Chital/Hog/Rusa

2. What is your main hunting method? Stalking/Stalking with a gundog/Hound hunting/Bow Hunting/Spotlighting

3. Have you been deer hunting in the past two months? (name months) Yes/No
   (if 'Yes', proceed to question 4)

4. How many Deer hunting trips have you taken over this two-month period?
   (Each trip needs to be treated separately for question 5–11)

5. How many days did you go hunting?

6. How many deer did you harvest? When a hunter says he has harvested deer by hound hunting (scent-trailing hounds), check that it was what the individual got and not the group.

7. What species were the deer? Sambar/Fallow/Red/Hog/Chital/Rusa

8. What was the sex of the Deer? Male/Female

9. How were the deer taken? Stalking/Scent-trailing hounds/Stalking with a gundog/Bow

10. Did you hunt on private land or public land? Public/Private/Both

11. What was the closest major town to the area you hunted?

Appendix B

Questionnaire for Game Licence holder endorsed to hunt deer using hounds

1. Have you been hound hunting in the past two months? (name months) Yes/No

(if 'Yes', proceed to question 2, if 'No' Go to Q 10)

2. How many hound hunting trips have you taken over this two-month period?

(Each trip needs to be treated separately for question 3–8)

6. How many days did you go hunting?

7. How many hunters in your team?

8. How many deer did your team harvest?

9. How many deer did you harvest?

10. What was the sex of the Deer?

11. Did you hunt on private land or public land?

12. What was the closest major town to the area you hunted?

13. Have you been deer hunting without hounds in the past two months? Yes/No

14. How many non-hound hunting trips have you taken over this two-month period?

(Each trip needs to be treated separately for question 12–13)

15. How many days did you go hunting?

13. How many deer did you harvest?

Game Management Authority

Appendix C

Common definitions used

SD = standard deviation of the data; it represents the variation in the numbers reported.

SE = standard error of the mean; it represents the variation in the estimated mean.

CV = coefficient of variation; it is calculated as: CV = SE ÷ 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:

$p_j = \frac{h_j}{n_j}$ e.g. for Deer Survey 4 in 2015, we obtained: $\frac{70}{200} = 0.350$.

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:

$H_j = p_j L$ e.g. for Deer Survey 4 in 2015, we obtained: $0.35 \times 30{,}908 = 10{,}818$.

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):

$w_j = \frac{y_j}{h_j}$ e.g. for Deer Survey 4 in 2015, we obtained: $\frac{215}{70} = 3.07$.

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):

$W_j = w_j H_j$ e.g. for Deer Survey 4 in 2015, we obtained: $3.07 \times 10{,}808 = 33{,}226$.

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

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

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

e.g. for Deer Survey 4 in 2015, we obtained: .

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

, e.g. for Deer Survey 4 in 2015, we obtained: $\frac{4.55}{\sqrt{70}} = 0.54$.

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

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

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

$$\mathrm{SE}(W_j) = \mathrm{CV}\left(W_j\right) \times W_j .$$

The standard error of the total harvest was calculated as follows:

$$\mathrm{SE}(W_{TOT}) = \sqrt{\left(\mathrm{SE}(W_1)\right)^2 + \left(\mathrm{SE}(W_2)\right)^2 + \cdots + \left(\mathrm{SE}(W_6)\right)^2} .$$

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 could not be reported as the estimate plus or minus a fixed value. For some estimates, denoted as , 95% confidence interval limits were calculated using:

upper limit (*UL*)

lower limit (*LL*) , where:

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

e.g. for the total deer harvest in 2015 we have

$$CV = \frac{8{,}349}{71{,}142} = 0.117$$

Therefore, upper and lower confidence limits are given by:

$$UL = 71{,}142 \times 1.26 = 89{,}471$$

$$LL = 71{,}142 \div 1.26 = 56{,}567.$$

Appendix D

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. It is sometimes referred to as a box-and-whisker plot. 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 (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. An outlier is defined as any point that is either below Q1 – 1.5 × IQR or above Q3 + 1.5 × 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: approximately 25% of the data are in the range between a whisker and the nearest edge of the box, and approximately 25% of the data are in the range between an edge of the box and the median line. Thus, approximately half the data are thus contained within the box. Any unusual data are highlighted as outliers. As an example, using duck hunting, Figure D 1 shows a boxplot indicating that most hunters harvested between 5 and 13 ducks, and a quarter harvested between 13 and 27 ducks. A number of outliers harvested more than 27 ducks, including one who harvested over 50 ducks. Sometimes there are no whiskers because the minimum (or maximum) is the same as the lower (or upper) quartile (see Figure D1, which indicates that at least 25% of Game Licence Holders who hunted were unsuccessful).

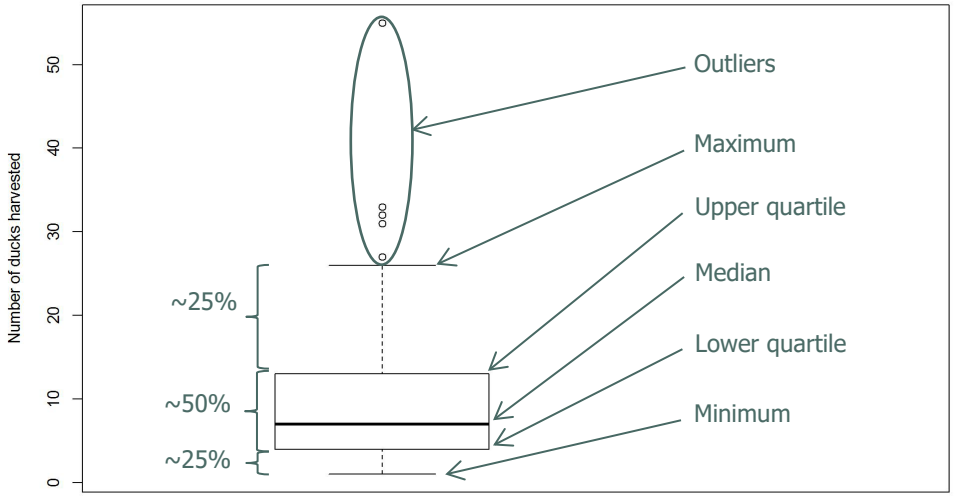

Figure D 1. Example boxplot, with labels

Appendix E

Harvest rates per Game Licence endorsed for hunting deer

Historically (from 2009 to 2016) the data collected only allowed for annual harvest rates to be at the level of Game Licence holder endorsed to hunt deer. Since 2017, when the end of year surveys have been conducted, it has been possible to estimate the annual harvest rate per active hunter. Therefore, the rate per Game Licence holder is not required. It has been included in this appendix to allow comparison between years before 2017.

The total average season harvest was 4.5 deer per Game Licence holder (95% CI = 3.6–5.5; Table E 1). Note that, for each survey period, the average deer harvest per Game Licence holder (Table E 1) was much lower than the average deer harvest per Game Licence holder who hunted (Table 3), because the former included those respondents who did not hunt during the survey period.

Table E 1. Estimates of average harvest of deer per Game Licence holder in each survey period in 2019.

Period	Average harvest[14]	SE	95% CI	
			Lower	Upper
Jan–Feb	0.48	0.26	0.18	1.31
Mar–Apr	0.68	0.13	0.47	0.99
May–Jun	1.10	0.29	0.66	1.82
Jul–Aug	1.23	0.19	0.90	1.67
Sep–Oct	0.56	0.11	0.38	0.82
Nov–Dec	0.42	0.12	0.25	0.73
Total harvest per licence holder	**4.48**	**0.48**	**3.63**	**5.53**

Each Game Licence holder endorsed to hunt deer hunted an average of 8.9 days during 2019, corresponding to a total of 344,604 hunter days (95% CI = 297,594–399,039; Table E 2).

Table E 2. Number of days deer were hunted per Game Licence holder for 2019.

Period	Days hunted	SE	95% CI	
			Lower	Upper
Jan–Feb	0.84	0.22	0.51	1.39
Mar–Apr	1.55	0.19	1.21	1.98
May–Jun	1.85	0.29	1.37	2.50
Jul–Aug	2.38	0.26	1.92	2.95
Sep–Oct	1.36	0.18	1.05	1.75
Nov–Dec	0.88	0.15	0.63	1.22
Total hunting days per licence holder	**8.86**	**0.54**	**7.87**	**9.98**

[14] Average harvest per Game Licence holder = Deer harvested divided by Respondents (Table 1).

Harvest rates per Game Licence endorsed for hunting deer using scent-trailing hounds

The total average season harvest was 4.9 deer per Game Licence holder using scent-trailing hounds (95% CI = 4.3–5.6; Table E 3). Note that, for each survey period, the average deer harvest per scent-trailing hound team member (Table E 3) was much lower than the average deer harvest per Game Licence holder who hunted using scent-trailing hounds (Table 12), because the former included those respondents who did not hunt with hounds during the survey period.

Table E 3. Estimates of average harvest of deer per Game Licence holder using scent-trailing hounds in each survey period in 2019.

Period	Average harvest[15]	SE	95% CI	
			Lower	Upper
Apr–May	1.24	0.17	0.95	1.62
Jun–Jul	1.33	0.17	1.03	1.71
Aug–Sep	1.43	0.14	1.18	1.74
Oct–Nov	0.93	0.15	0.67	1.28
Total harvest per licence holder	**4.93**	**0.32**	**4.35**	**5.59**

The average number of scent-trailing hound hunting days in each survey period varied throughout the season, with most hunting occurring from late autumn to mid-spring. Each Game Licence holder endorsed to hunt deer hunted an average of 10.9 days during 2019 (Table E 4).

Table E 4. Number of days deer were hunted using scent-trailing hounds per Game Licence holder for 2019.

Period	Days hunted	SE	95% CI	
			Lower	Upper
Apr–May	2.91	0.51	2.07	4.09
Jun–Jul	2.94	0.49	2.12	4.08
Aug–Sep	3.51	0.52	2.63	4.67
Oct–Nov	1.53	0.34	1.00	2.35
Total harvest per licence holder	**10.89**	**0.94**	**9.19**	**12.89**

[15] Average harvest per Game Licence holder = Deer harvested divided by Respondents (Table 1).

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