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Article in *Wildlife Research* · January 2007

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Oh deer, what can the matter be? Landholder attitudes to deer management in Queensland.

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Abstract. Four species of deer can be found in well established wild populations in Queensland. This paper reports on a survey of the attitudes of landholders towards deer on their properties. A total of 2621 surveys were mailed to landowners and managers in regions known to support wild deer in Queensland. Of the 28.3% of surveys returned over 75% of respondents conducted some form of primary production on their land and 65% of these had deer on their properties at least some of the time. Responses to questions were mostly uniform throughout the state with over 50% of respondents wanting the deer population to stay at current levels or increase. Only 5% of respondents supported poisoning as a management strategy with 17% supporting trapping. Recreational hunting and game meat harvesting were favoured management options with 42% and 51% support respectively. Only 25% of respondents thought wild deer caused environmental or agricultural damage with most associating wild deer as a less significant pest than those species already declared under state legislation. Fifty six percent of those surveyed agreed with the statement “It is important to maintain wild deer populations for future generations to enjoy”. The results of this survey have many implications for the effectiveness of any future management of wild deer in Queensland based on state legislation.

Introduction

Eighteen species of deer (Family Cervidae) have been released into the wild in Australia since about 1850 (Jesser 2005). Six of those species have become established in perhaps twenty populations, with estimates of total numbers as high as 200 000 individuals (Moriarty 2004). Three species can be found in well established populations in continental Queensland; fallow deer *Dama dama* in the south eastern granite belt region around Stanthorpe, red deer *Cervus elaphus* in the Brisbane and Mary Valleys of the south east, and chital deer *Axi axis* in the Charters Towers district of the central north. These deer have been present since the late nineteenth century and have been variously regarded as sport animals, a food source, farm stock and pests. A fourth species, rusa *Cervus timorensis* was deliberately released into the Torres Straight islands in the early 20th Century, but was not historically present in continental Queensland (Roff 1960, Bentley 1998, Harrison 1998). All deer species were listed as protected fauna in Queensland by state legislation until 1994 (Harrison 1998). Red deer even feature on the Queensland coat of arms, and as the emblem of the Esk Shire which gives Queensland deer a unique historical status among introduced vertebrates in Australia.

Since the early 1990's new populations of deer have been established throughout Queensland (Jesser 2005) as they have elsewhere in Australia (Moriarty 2004). The role of deliberate liberation and escapes of deer to the wild have been documented (Moriarty 2004; Jesser 2005), but there has been little documentation of the role that private landholders play in the persistence of deer in the wild. There is coordinated deer management in Queensland, for example both the Australian Deer Association (ADA) and Research into Deer Genetics and Environment (RIDGE) actively manage a number of properties throughout Queensland to enhance recreational deer hunting opportunities where deer already exist.

We hypothesise that the persistence and spread of deer has been enhanced by the actions, either conscious or unconscious, of landholders who do not actively remove wild deer from their land. If that is the case then the success of any management regime will be critically dependant on the cooperation of landholders in the areas where deer populations exist. This paper reports on a survey of the attitudes of landholders and land managers towards deer on their holdings, so that we might begin to understand the social environment in which these species have, and will continue to be, managed.

Methods

We attempted to send a questionnaire to every non-town and city residence in the three continental regions of Queensland where deer are known to occur (hereafter “historically recognised deer regions” or HRDR). The HRDR do not conform to any standard cadastral boundaries so the ADA derived our list for us by filtering survey names and addresses (SNA) within the three HRDR from AOD (Australia on Disk © Brylar Pty Limited). AOD contains all listings (6,992,122) for the 55 Residential 2003 Whitepages Telephone Books on a CD. ADA first selected Queensland SNA with postcodes beginning in 4. Next, they selected each telephone directory covering the HDRD and extracted all SNA to an Access database. All towns within the HRDR were identified and Access queries were used to filter out all SNA in the database that were found in the selected towns. This was done by drawing boundaries around each town, identifying all roads and streets within the boundaries and excluding all SNA that weressociated with those roads and streets.

In this way the ADA generated 2621 SNA. Questionnaires were mailed directly to recipients at each of those SNA (Table 1). Three questionnaires were also mailed to community councils in Torres Straight that have responsibility for islands known to support rusa deer. All questionnaires were on standard A4 paper and were colour coded for region (equivalent to deer species), but had no other marks or features that could identify respondents. All questionnaires included a self-addressed, postage paid envelope (addressed to the University of Queensland) to encourage replies.

Table 1. Historically Recognised Deer Regions (HRDR) selected for mail survey and the deer species they support.

HRDR	Deer species	Questionnaires sent
Granite belt-Stanthorpe	Fallow	440
Brisbane and Mary Valleys	Red	2106
Charters Towers	Chital	75
Torres Straight (land councils)	Rusa	3

The first five survey questions asked about the characteristics of the property and the people who run the property, the next five asked if deer were present and if so, the duration of occupation, what were the attitudes of the respondents to listing deer as a pest, what population level would the respondent like to see for deer in their area, and by what means would the respondent like to see that level achieved. The next twelve questions asked respondents to rate their attitudes to various aspects of deer and their effects on the environment Queensland-wide. The final question asked respondents to rate their attitudes about the significance of fifteen terrestrial vertebrate species or groups of species (including deer) as pests in Queensland. The responses were categorical but a chi-square analysis to detect associations between the responses from the three HRDR could not be performed because the expected values in some table cells were too small to allow valid analysis, and the calculation of exact probabilities was too large a task to be successfully completed on standard computing hardware. Instead we calculated a Monte Carlo estimate of the exact probabilities using Proc FREQ in SAS.

Results

None of the 3 questionnaires that were sent to Torres Straight were returned and that region will not be considered further here. In other regions between 4% and 21% of the original questionnaires were returned without responses either because the post office could not deliver them, or the recipient returned them, mostly with a note explaining that the addressee was no longer at that address (Table 2). These questionnaires were regarded as not reaching their target recipient and were not considered further.

Of the questionnaires that did reach their recipient, and which were returned in some completed form, there were between 1% and 3% where all the data were unusable (Table 2), resulting in between 24% and 28% usable returns as a proportion of questionnaires that reached their addressee (Table 2).

Table 2. Fate of questionnaires. Figures are numbers of questionnaires (%).

HRDR	Returned by Post Office ¹	Returned by recipient ¹	Total not received ¹	Returned but data unusable ²	Returned and used ²
Granite belt-Stanthorpe	42 (9.5)	2 (0.5)	44 (10)	6 (1.6)	102 (25.7)
Brisbane and Mary Valleys	427 (20.3)	9 (0.4)	436 (20.7)	15 (0.9)	463 (27.7)
Charters Towers	1 (1.3)	0	1 (1.3)	2 (2.7)	18 (24.3)
Total	470 (17.9)	11 (0.4)	481 (18.4)	23 (1.1)	583 (27.2)

1. % of total sent out

2. % of total received by addressee

There were no significant associations between HRDR and the category of land occupant (owner or manager) or the time of residence on the land. Across all three HRDR 95.4 % of responses came from land owners and an average of 89.3% (± 5.2 , 1 s.d.) had been on their property for more than ten years. However, there were regional differences in some characteristics. Properties in the Charters Towers region were significantly bigger, the main property enterprise was cattle grazing, and a greater proportion of properties had never had deer present than was the case in other regions (Table 3).

Table 3. Characteristics of people and properties. Number of responses (%).

	Granite Belt- Stanthorpe- Fallow Deer	Brisbane and Mary Valleys- Red Deer	Charters Towers- Chital Deer	Total	Exact Probability Estimate ¹
How big is the land you own/manage? (hectares ²)					
0-400	80 (79)	382 (82.5)	0	462 (79.4)	0.00
400-2000	12 (12)	49 (10.6)	0	61 (10.5)	
2000-4000	4 (4)	17 (3.7)	0	21 (3.6)	
4000-8000	5 (5)	9 (1.9)	0	14 (2.4)	
>8000	0	6 (1.2)	18 (100)	24 (4.1)	
What is the main use of your property?					
Cattle	28 (22.9)	215 (40.9)	18 (100)	261 (39.2)	0.00
Sheep	18 (14.8)	6 (1.1)	0	24 (3.6)	
Crops	33 (27)	49 (9.3)	0	82 (12.3)	
Lifestyle	34 (27.9)	179 (34.0)	0	213 (32.0)	
Other	9 (7.4)	77 (14.6)	0	86 (12.9)	
Are wild deer present on your property?					
Yes, always	11 (11)	94 (20.9)	6 (38)	111 (19.6)	0.01
Yes, sometimes	49 (49)	208 (46.2)	2 (13)	259 (45.8)	
No, never	31 (31)	111 (24.7)	8 (50)	150 (26.5)	
Unsure	9 (9)	36 (8)	0	45 (8.0)	

1. Monte Carlo estimate of exact probabilities for association between attributes and geographic region.

2. Survey asked question framed in acres. Converted to hectares for reporting here.

Almost all respondents recognised the species of deer in their region as being the same as recognised by management agencies (e.g. Jesser 2005). However, up to 25% of responses listed species in addition to those commonly regarded as being present (Table 4). In all regions almost 90%, or more, of the properties had recorded deer being present for more than 5 years (Table 4), however, there was a significant association between the longest presence category and the Charters Towers region (Table 4).

Table 4. Recognition and persistence of deer. Number of responses (%).

	Granite belt-Stanthorpe. Fallow Deer	Brisbane and Mary Valleys. Red Deer	Charters Towers. Chital Deer
Regional Species Recognised	33	116	8
Additional Species Recognised	red 1, unknown 2	rusa 12, sambar 1, fallow 6, chital 7, unknown 3	rusa 2
How many years have deer been present on your property? $P=0.002^1$			
0-2	3 (6.1)	13 (5.1)	0
>2-5	1 (2.0)	16 (6.3)	0
>5-10	17 (34.7)	29 (11.4)	1 (12.5)
>10-30	21 (42.9)	86 (33.7)	2 (25)
>30	7 (14.3)	111 (43.5)	5 (62.5)

1. Monte Carlo estimate of exact probabilities for association between duration of presence and geographic region

Across all HRDR almost 60% of respondents said that, if they were given the opportunity, they would vote against deer being declared a pest. However, there were regional differences with a majority of respondents in the Granite Belt in south-east Queensland, near Stanthorpe willing to vote for pest declaration (Table 5). There were no associations between HRDR and the desired trend in population. In all HRDR the present population level was the most popular response (mean 39.0% \pm 1.8%), followed by complete removal (mean 26.9% \pm 4.7%). Together the options ranging through maintaining the current population level, or slightly or moderately increasing it accounted for an average of 56.3% (\pm 6.3%) of responses across all HRDR. There was no significant association between HRDR and the favoured mode of population management ($p= 0.08$, Monte Carlo simulation of exact test). The most common response was game meat harvesting (mean 41.2% \pm 5.9%). Poisoning was favoured by less than 5% of those questioned, and 51% of those responses came from landholders who favoured complete removal of deer. Trapping was marginally more popular with 17% of respondents supporting this method. Recreational hunting and game meat harvesting were favoured management options with 42% and 51% respectively. Twenty six percent chose no management as an option.

Table 5. Attitudes towards a declaration of deer as a pest. Number of responses (%)

	Granite belt- Stanthorpe. Fallow Deer	Brisbane and Mary Valleys. Red Deer	Charters Towers. Chital Deer	Total	Exact Probability Estimate ¹
Given the opportunity would you vote for or against declaration of deer as a pest?					
Yes, for declaration	54 (54)	180 (40.2)	7 (46.7)	241 (42.9)	0.039 ²
No, against declaration	45 (46)	268 (59.8)	8 (53.3)	321 (57.1)	

1. Monte Carlo estimate of exact probabilities for association between attributes and geographic region.

2. Probability of obtaining calculated chi-square value.

There was a significant association between HRDR and respondents willingness to vote for pest declaration (Table 5). More than half of the respondents from the Granite Belt (55%) would vote in favour of pest declaration whilst more than half of respondents from the other two HRDR would vote against it (Table 5). Across all regions combined 32.8% of respondents who wanted either a slight decrease or complete removal of deer would vote for pest declaration. Conversely, 53% of respondents who were in favour of either a moderate or slight population increase or the current population level would vote against pest declaration.

Irrespective of region (hence of the predominant deer species) most respondents did not believe that deer caused environmental damage, were an agricultural pest, or were a management problem on their property (Table 6). Most viewed deer as different to native species, and either enjoyed or were neutral about having deer present. However, the majority of respondents were also neutral or believed that deer were not an asset to their property. Similarly in all regions almost 70% of respondents were either neutral or believed that it was important to maintain deer for future generations to enjoy (Table 6).

Table 6. Attitudes to deer in a Queensland-wide context. Number of responses (%). Questions where there was an association between region and ranking (Monte Carlo estimate for the exact test, $P < 0.05$) are in italics. Otherwise there was no significant association.

Statement	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Wild deer cause environmental damage on my property	167 (30.8)	122 (22.5)	118 (21.7)	77 (14.2)	59 (10.9)
Wild deer are an agricultural pest on my property	169 (31.1)	108 (19.9)	103 (19.0)	88 (16.2)	75 (13.8)
<i>Wild deer significantly compete with livestock on my property</i>	<i>181 (33.7)</i>	<i>114 (21.2)</i>	<i>137 (25.5)</i>	<i>65 (12.1)</i>	<i>40 (7.5)</i>
Wild deer are a management problem on my property	178 (32.9)	121 (22.4)	116 (21.4)	62 (11.5)	64 (11.8)
I enjoy having deer on my property	102 (19.4)	51 (9.7)	117 (22.2)	138 (26.2)	118 (22.4)
<i>Wild deer provide a useful source of income to my business</i>	<i>207 (39.3)</i>	<i>95 (18.0)</i>	<i>184 (34.9)</i>	<i>27 (5.1)</i>	<i>14 (2.7)</i>
Wild deer are an asset to my property	149 (28.3)	77 (14.6)	171 (32.4)	89 (16.9)	41 (7.8)
<i>I view wild deer as similar to native species</i>	<i>142 (25.7)</i>	<i>85 (15.4)</i>	<i>50 (9.1)</i>	<i>202 (36.6)</i>	<i>73 (13.2)</i>
I view wild deer as similar to feral pests	154 (27.8)	128 (23.1)	57 (10.3)	83 (15.0)	131 (23.7)
I view deer as a game species	67 (12.3)	46 (8.4)	84 (15.4)	246 (45.1)	102 (18.7)
In general, I do not like having deer on my property	140 (25.9)	119 (22.0)	94 (17.4)	79 (14.6)	108 (20.0)
It is important to maintain wild deer populations for future generations to enjoy	111 (20.0)	65 (11.8)	65 (11.8)	184 (33.3)	128 (23.1)

When asked about their opinions of various mammals as either an agricultural or environmental pest, more than half the respondents across all regions rated feral cats, pigs, mice, rats, dingoes/wild dogs, and rabbits as very significant pests. Red foxes were also rated as a very significant pest overall, but significantly less respondents rated this species as a very significant pest in the Charters Towers region, compared to the other two regions (Table 7). The species that were rated as the least significant pests were wallabies and kangaroos. Wild deer were rated as very significant or significant pests by less than 30% of respondents, about the same level as wild donkeys (Table 7). Wild donkeys were rated as significant pests by a significantly greater number of respondents from the Charters Towers regions than from other regions.

Table 7. Responses (%) to question “For the whole of Queensland, how would you categorise these species as a pest, either to agriculture or the environment”. For species except red foxes and donkeys (in italics) there was no association between ranking and the HRDR (Monte Carlo estimate for the exact test, $P < 0.05$).

Species	Very Significant Pest Species	Significant Pest Species	Moderate Pest Species	Slight Pest Species	Not a Pest Species
Feral Cats	419 (74.3)	62 (11.0)	46 (8.2)	25 (4.4)	15 (2.7)
Feral Pigs	395 (69.2)	119 (20.8)	34 (6.0)	10 (1.8)	13 (2.3)
Rabbits	385 (68.4)	105 (18.7)	38 (6.7)	18 (3.2)	17 (3.0)
Wild dogs/dingoes	333 (58.8)	130 (23.0)	64 (11.3)	30 (5.3)	9 (1.6)
<i>Foxes</i>	<i>330 (58.4)</i>	<i>108 (19.1)</i>	<i>75 (13.3)</i>	<i>36 (6.4)</i>	<i>16 (2.8)</i>
Mice	321 (57.0)	119 (21.1)	79 (14.0)	34 (6.0)	10 (1.8)
Rats	308 (54.6)	111 (19.7)	85 (15.1)	46 (8.2)	14 (2.5)
Feral Goats	212 (38.1)	140 (25.1)	103 (18.5)	52 (9.3)	50 (9.0)
Hares	133 (23.8)	77 (13.8)	118 (21.1)	122 (21.8)	110 (19.6)
<i>Wild donkeys</i>	<i>90 (16.6)</i>	<i>84 (15.5)</i>	<i>137 (25.2)</i>	<i>130 (23.9)</i>	<i>102 (18.8)</i>
Brumbies	69 (12.6)	65 (11.9)	137 (25.0)	143 (26.1)	133 (24.3)
Wild deer	87 (16.0)	69 (12.7)	88 (16.2)	129 (23.7)	171 (31.4)
Kangaroos	68 (12.0)	77 (13.6)	105 (18.5)	111 (19.6)	206 (36.3)
Wallabies	58 (10.2)	61 (10.8)	90 (15.9)	116 (20.5)	242 (42.7)

Discussion

We believe that the database for the survey accurately targeted the desired demographic with over 65% of respondents having deer on their properties at least some of the time. Over 75% of respondents conducted some form of primary production on their land.

The high return rate of 28.3% for a “cold” postal survey (i.e. with no preparatory literature sent, and no follow up soliciting returns) probably indicates a good deal of interest in the topic amongst landholders (Moser & Kalton 1985; Frazer & Lawley 2000). Because the survey was sent to people who shared only their locality and had no follow up letters or phone calls we expected a return rate in the vicinity of 10%. For example Dryden (2004) received an 11% response rate from farmer/grazier organisations in a similar cold postal survey exploring their attitudes towards commercial safari hunting in Australia.

One possible reason for the unexpectedly high return of surveys could be the significance of wild deer to those landholders and managers who live in an area where wild deer occur. This is supported by the fact that over 20% of returned surveys had extra comments (either praising or cursing the presence of deer) written on the back of the survey. It is also possible that rural property owners in Queensland appreciate the opportunity to make first-hand comment on issues affecting them. One respondent even wrote “send more surveys I love them” suggesting that the novelty of this sort of survey may have contributed to the high return rate.

The lack of regional differences for nearly all questions suggests that the issues facing rural landholders and managers in the surveyed areas are very similar. One important exception to this is the proportion of respondents who would vote for or against the declaration of deer as a pest species. The response to this question in the Brisbane/Mary valley area were most polarised (in favour of not declaring deer pests). Whereas the responses from the other two areas were more equivocal on this question. This difference

was also reflected in the response to “What trend would you like to see to the deer population in your area”. Although there was a significant difference between areas to this question in all areas over 50% of respondents would like the deer population to stay at current levels or to increase. The responses to these two questions alone suggest that to declare all deer species as a pest throughout Queensland would at best only receive the support of half the community who have wild deer in their area. This has important implications for the success of any future state wide management of wild deer based on legislation.

Regardless of how landowners and managers viewed the legal status of wild deer or their preference for population trends of wild deer herds their response to possible management strategies was markedly similar. Poisoning was very unpopular, trapping was marginally more popular but recreational hunting and game meat harvesting were the most favoured management options. Presumably the respondents who supported the no management strategy liked wild deer in their region and saw no need to change the status quo. These responses would suggest that if management of wild deer in Queensland was to be formalised through legislation both the game meat industry and recreational hunters would be welcomed onto many private properties. It is also likely that if wild deer were declared pests any attempt to implement a coordinated baiting program, like those used for feral pigs and wild dogs, would not receive widespread support in areas with long established wild deer herds.

Increases in deer populations both in terms of total numbers and distribution have been documented by the Queensland Department of Natural Resources and Mines (2004), Jesser (2005) and Moriarty *et al.* (2001). This survey further documents the distribution of new species of deer in areas that have been traditionally associated with only one species (Table 4).

Wild deer have recently been credited with causing, or being likely to cause, environmental damage in Australia (Moriarty *et al.* 2001, Jesser 2005). Although there may be localised areas where this can be clearly demonstrated it would appear that the private land managers in this survey who have wild deer in their area do not support this idea. Only 25% of survey respondents agreed with the statement that “wild deer cause environmental damage on my property”. This response may not be surprising given that most survey recipients land use was focussed towards primary production and not conservation.

Extra comments made by survey respondents highlighted direct competition for resources with domestic stock, direct damage to crops and orchards and the indirect threat of disease and parasite transmission as significant issues associated with wild deer. Despite the potential financial costs to primary producers from these impacts of wild deer only 25% of respondents agreed with the statement “Wild deer are an agricultural pest on my property”. This is surprising given that 63% of respondents identified cattle, sheep or crops as the main land use of their properties. A further 15% identified “other” as the main land use which accounted for all other forms of primary production including orchards and other grazing stock.

It is possible that in many areas the density of wild deer is so low that negative impacts are not noticed by primary producers. It is also possible that the positive attributes that landholders associate with the presence of wild deer outweigh the negative. Forty eight percent of survey respondents agreed with the statement “I enjoy having wild deer on my property” as opposed to the 35% who agreed with “In general, I do not like having wild deer on my property”. Half of respondents viewed wild deer similarly to native species and 64% viewed deer as a game species while only 39% viewed wild deer as a feral pest. Even less survey respondents, 23%, considered wild deer as a management problem and only 19% said wild deer compete with livestock. Significantly, 56% of the landowners and managers who responded to this survey agreed that “It is important to maintain wild deer populations for future generations to enjoy”.

When asked to rank wild deer against other vertebrate pests in Queensland, both native and introduced, the landowners and managers represented by this survey clearly associated wild deer as a less significant pest than those species already declared under state legislation. Wild deer were more closely ranked along side wallabies and kangaroos, as were brumbies.

Wild deer in Queensland represent many different things to different people (Jesser 2005). If new legislation regarding wild deer is to be effective as a basis for the management of deer in Queensland it is important to have landowner support. We believe the attitudes revealed in this survey are consistent with the notion that landholder actions, either conscious or unconscious, have contributed to the persistence of wild deer populations in Queensland. Further, our results support the argument made by Jesser (2005) that within the historically established deer ranges of Queensland, deer could be effectively managed as a game species. This should not necessarily be to the detriment of those property owners who perceive wild deer as pests. Tasmania implemented Property Based Game Management on a state wide level in 1993 (Murphy 1995; Hall 2004). This is only one example of deer being managed in an Australian context with the aim of achieving satisfactory outcomes for all concerned.

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