

1 Article

2 Online Relinquishments of Dogs and Cats in Australia

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8 **Simple Summary:** The aim of this study was to analyse dog and cat advertisements on a popular
9 online trading website in Australia in February, 2016. It was estimated >31,000 dogs and >24,000 cats
10 are relinquished/year on gumtree.com.au. More cats than dogs were advertised free, with a median
11 age of 1.42 years in dogs and 0.9 years in cats. Compared to the human population there were
12 proportionately more ads in Queensland and fewer ads in Victoria. In comparison to pets from
13 animal shelters advertised on petrescue.com.au there were more pure bred dogs on
14 gumtree.com.au, although the common breeds were similar. People who had relinquished a dog or
15 cat on gumtree.com.au used it because they believed shelters were full, they wanted to see/interview
16 the new owner, or because they originally got the animal on gumtree and it works. These results
17 shed light on a hitherto under-studied population of relinquished dogs and cats.

18 **Abstract:** While traditionally people relinquish their pets to an animal shelter or pound, the internet
19 provides a newer method to re-home. We analysed advertisements (ads) on the largest website in
20 Australia for trading dogs and cats, gumtree.com.au. Data was collected for dogs on February 7, 16
21 and 24, 2016 and cats on February 9, 19 and 26, 2016 with 2640 ads for relinquished dogs, and 2093
22 ads for relinquished cats. It was estimated >31,000 puppies/dogs and >24,000 kittens/cats are
23 relinquished on gumtree.com.au per year. The median age of dogs was 1.42 and cats 0.9 years of
24 age. There were 23% of dog ads free and 62% of cat ads free. Compared to the human population
25 there were proportionately more ads in Queensland and fewer ads in Victoria. A total of 15 people
26 were surveyed who had relinquished a dog or cat using gumtree.com.au. The dog owners used
27 gumtree.com.au because they believed the shelters were full (n = 4), and; they wanted to
28 see/interview the new owner (n = 2). For cat owners it was because they had originally got the cat
29 on gumtree.com.au (n = 2); they use gumtree.com.au for other things, and it works (n = 2), and; they
30 wanted to see/interview the new owner (n = 2). The data collected will be valuable for
31 implementation of policy and interventions to protect the welfare of un-wanted dogs and cats.

32 **Keywords:** relinquishment; dog; cat; online; Australia

33

34 1. Introduction

35 Australia has an owned dog and cat population of approximately 4.8 million and 3.9 million,
36 respectively [1]. However, it is likely that the total population of dogs and cats is higher, as un-
37 owned animals - strays, and those in registered or independent shelters or pounds would also
38 contribute to the total population. In addition, the ownership of an animal may be transferred
39 through sale or other trade, and animals in a shelter or pound can be rehomed. This results in a
40 complex network of animals transferred between the owned and un-owned populations, and
41 between different owners. Animals leave the care of their owners through surrenders to a shelter or
42 pound, being abandoned, being given away or being sold. Worldwide there have been attempts to
43 measure the un-owned population of dogs and cats in shelters [2,3], but there is a lack of research
44 into the dogs and cats that are transferred between owners and between owned and un-owned
45 populations in other ways.

46 Much of what we know about the flow of animals from the owned and un-owned populations
47 comes from rescue shelters and pounds. Larger rescue organisations collect data on numbers of
48 surrendered dogs and cats each year. There were 55,570 cats admitted to RSPCA shelters around
49 Australia in 2015/16, with numbers rising in the last few years. In contrast there were 45,256 dogs
50 admitted to RSPCA shelters in the same year and numbers are declining [4]. However, the RSPCA
51 represents only a portion of the surrendered population. The total number of both stray and
52 surrendered dogs in Australia in 2012/13 from shelter and local municipal facilities, has been
53 estimated at 211,655 dogs relinquished, with 101,037 of these reclaimed [2]. There is no data
54 available estimating the total numbers of stray and surrendered cats in Australia, although it is
55 likely to be even higher. The incidence of unowned dogs and cats is a worldwide problem, with an
56 estimated 129,743 dogs and 131,070 cats entering UK shelters in 2009 [3], and a study from South
57 Korea reporting over 10,000 abandoned dogs in Seoul [5]. In the US, it was estimated that 4.4% of
58 dog- and 3.8% of cat-owning households had relinquished a pet to a shelter in the previous year [6].

59 The relinquishment of pets represents a significant cost to society in a number of ways. In
60 Australia in 2004 there was an estimated \$AUS180 million spent annually by animal welfare
61 agencies (ACAC 2006), while in the United Kingdom expenditure by animal welfare organisations
62 was approximately £340 million in 2010 [7]. Local governments in Australia in 2004 spent \$AUS83
63 million on animal management (ACAC 2006); in the UK in 2011 the comparable figure was £57.5
64 million [8]. While local government costs include dog registrations and dealing with dog attacks, a
65 large portion of these figures would be expected to arise from stray and relinquished animals.

66 As well as the economic costs there are also emotional costs as people may be forced to
67 relinquish their pets due to external influences, such as a relationship breakdown or inability to find
68 rental accommodation that will allow a pet [9,10]. There are also emotional costs experienced by
69 staff involved in euthanizing large numbers of pets at shelters, with shelter workers struggling with
70 the moral dilemma of their job, often resulting in mental health problems and high staff turnover
71 [11-13]. Finally, un-owned dogs and cats are at an increased risk of impaired welfare using both
72 physical and psychological measures of welfare [14,15], as well as the emergence of diseases,
73 demonstrated by an outbreak of virulent systemic feline calicivirus in cats [16], and of *Streptococcus*
74 *equi* pneumonia in dogs [17].

75 If we are to design evidence-based strategies to reduce the numbers of dogs and cats
76 relinquished, as well as protect the welfare of pets in which relinquishment cannot be avoided, we
77 need to know more about the population of dogs and cats involved. Some shelters survey owners
78 who are relinquishing pets to determine their reasons for relinquishment [18,19], and also collect
79 demographic data on the age, sex and breed of the relinquished animal [4,18,19]. While this
80 information is not perfect (for example, owners may not be truthful about the behaviour of their pet
81 if they think it will negatively impact the likelihood of that pet finding a new home), it has been
82 helpful in designing interventions. For instance, knowing that sometimes pets are relinquished
83 because owners cannot find rental accommodation that allows pets has resulted in real changes,
84 with the Australian state of Victoria recently announcing modifications to rental agreements to
85 make it easier for people to rent with pets [20].

86 As stated above, pets can leave their owners not only by being surrendered to a pound or
87 shelter, but also through being given away or sold. Numbers of dogs and cats falling into this
88 category have not previously been studied due to the diverse and diffuse methods people can
89 choose, including newspaper advertisements (ads), notices on bulletin boards and word of mouth.
90 However, the internet has enabled a more visible population of dogs and cats being traded. In the
91 European Union, online classified adverts are now the most common method to purchase a pet,
92 with over 400,000 dogs and over 100,000 cats advertised online on a given day [21]. In Australia,
93 Gumtree (gumtree.com.au) has the highest volume of online ads for dogs and cats, followed by
94 Trading Post (tradingpost.com.au). Breeders of pure breed dogs also advertise on DogzOnline

95 (dogzonline.com.au), although this site represents a smaller number of animals compared to
96 Gumtree and Trading Post. Other forms of social media, such as Facebook®, also advertise pets for
97 sale or to find new homes. These online sites advertise both puppies and kittens being sold by a
98 breeder, and animals being relinquished.

99 There has been limited research into online trading of dogs and cats. In a US study, dog
100 breeders who advertised puppies on the internet were less knowledgeable about health issues
101 specific to their breed/s and less likely to screen their animals for heritable diseases compared to
102 dog breeders who did not advertise their puppies on a puppy internet site [22]. To our knowledge,
103 no published studies have focussed on pets being relinquished online. The aims of the present
104 study were to: 1) estimate the total numbers and prices of dogs and cats relinquished online on
105 gumtree.com.au; 2) analyse the breed and Australian State/Territory of origin of dogs and cats
106 relinquished on gumtree.com.au and compare with animals presented to petrescue.com.au (an
107 online charity advertising pets from a shelter or rescue organisation in Australia) and the RSPCA;
108 and 3) interview a sample of pet owners relinquishing their pets on gumtree.com.au to determine
109 their reasons for relinquishment and why they chose to advertise their pet online.

110 2. Materials and Methods

111 2.1 Extraction of data

112 Data from gumtree.com.au were collected over approximately three weeks for both dogs and
113 cats: February 8, 17 and 25, 2016 for dogs and February 9, 19 and 26, 2016 for cats. Data were
114 extracted using the BeautifulSoup module in python to parse the adverts, then cleaned and
115 analysed using R (R Core Team 2017) and Pivot tables in Microsoft Excel®. Cleaning was
116 completed within Excel® by scrutinising individual ads to remove duplicates or ads that were not
117 for dogs or cats (e.g. equipment, pet sitting services). Data for the dog and cat breed and
118 cross/purebred status, owner status (owner/breeder), age, price and State/Territory were collected.
119 Where the town, but not the State or Postcode, were provided, an internet-based Postcode finder
120 (<http://auspost.com.au/postcode>) was used to determine the State/Territory. If there was more than
121 one place with the same name in more than one State/Territory then the ad was left as
122 State/Territory unknown. An estimate of the number of dogs and cats in each ad was made by
123 generating random numbers using R and then analysing the average number of dogs/cats per ad in
124 those random ads. Data on neuter, microchip and vaccination status were not collected as a
125 minority of ads reported on these factors.

126 2.2 Analysis of relinquishment ads

127 Dogs and cats advertised on the internet represent a mixture of puppies/kittens being sold
128 alongside pets being relinquished or traded. Many ads request a sum of money for the pet, even
129 when it appears the pet is being relinquished. The definition of relinquishment used for this study
130 was the Oxford definition: 'Voluntarily cease to keep or claim; give up'
131 (<https://en.oxforddictionaries.com/definition/relinquish>). Dogs were defined as being relinquished
132 if: 1) there was a statement within the ad confirming that a new home was being sought (e.g.
133 seeking new home, very sad to part with..., need to find a new forever home); 2) they were being
134 offered for free at any age; or 3) if the dog was older than 16 weeks of age and there was no
135 indication it had been advertised as a puppy and was still looking for a home (''X' is a 6 year old
136 pure bred Sheffield Blue Heeler. He is very friendly and good with other dogs and children.
137 Microchipped and wormed. To good home only.'). The type of seller (breeder or owner) was not
138 used to define relinquished pets as there were some breeders who were relinquishing pets using the
139 above criteria (e.g. 'Owner breeder out of work and no petmanent (sic) home, current home being sold by
140 owner cannot find another suitable home.' or 'Three female blue amstaffs mother and her two daughters ive
141 raised my intentions were to bread (sic) them but things have changed there pedigree papered registered ect

142 (sic) spent alot \$ for these lines call for more info ect (sic)'. The same criteria were used to determine a
 143 cat being relinquished. In some ads there was more than one animal advertised. In those cases, data
 144 was collected only from the first animal mentioned in the ad (e.g. breed, age, price), and the other
 145 animal/s were not included.

146 The relinquished ads on Gumtree per State/Territory were compared with data provided by
 147 John Bishop, Co-Founder and Joint CEO of PetRescue (<https://www.petrescue.com.au/>), for the
 148 same time period as the Gumtree data were collected and the published figures from the RSPCA
 149 between July 1 2014 and June 30 2015.

150 2.3 Surveys of owners who had relinquished dogs or cats

151 An email was sent through gumtree.com.au informing people about the study that we were
 152 conducting and asking if they would be willing to participate. Ads were chosen from those
 153 available online using the criteria for identifying a relinquished dog, outlined above. These were
 154 selected starting from the first ads shown on each day. Due to the high numbers not all ads for
 155 relinquished dogs or cats were included on each day. A total of 324 emails were sent to dog owners
 156 and 299 emails to cat owners (Table 1). The owners responded to the email either by return email or
 157 by phone. Surveys were performed either on the phone or in written form via email, depending on
 158 the preference of the respondent. Questions included: the demographics of the animal (age, breed,
 159 sex, neuter status, microchip); two Likert type scale questions on satisfaction with the health and
 160 behaviour of the animal (1 is very dissatisfied and 5 is very satisfied); Where did you get pet's name
 161 from originally?; What was the main reason you advertised pet's name?; Why did you decide to
 162 advertise on Gumtree instead of going to a shelter; Did you advertise pet's name anywhere else?;
 163 Have you successfully found a new owner for pet's name yet?; If yes, do you know anything about
 164 the new owner? Participants were also given an open ended question at the end of the survey to
 165 add any other details they wished to share. Approval for this study was provided by the University
 166 of Adelaide Human Ethics Committee (H-2016-036).

167 **Table 1.** Date and number of emails sent out through gumtree.com.au to owners of dogs and cats
 168 relinquished online.

Date	Dog (no of emails)	Cat (no of emails)
11 May 2016	46	0
13 May 2016	76	0
17 May 2016	51	18
23 May 2016	0	64
26 May 2016	61	28
June 6, 2016	0	39
June 7, 2016	0	34
June 10, 2016	30	61
June 14, 2016	60	55
TOTAL	324	299

169 2.4 Statistical Tests

170 Comparisons between groups where the data was not normally distributed were made using
 171 Mann-Whitney tests. Categorical data was compared used Chi-square tests. Data are presented as
 172 Mean \pm SEM unless otherwise stated. A significance level of $p < 0.05$ was used for statistical testing.

173 **3. Results**174 *3.1. Dogs on Gumtree*

175 A total of 2640 individual ads were identified for dogs being relinquished on gumtree.com.au
 176 between February 7 and 24, 2016. There were 1328 ads on February 7, 1411 ads on February 16 and
 177 1450 ads on February 24. Of these, 650 were new ads on Feb 16, and 663 were new ads on Feb 24,
 178 giving an estimate of 82 new ads/day, or by extrapolation (x 365) 29,930 ads per year. The average
 179 number of dogs per ad in 50 random ads was 1.06, giving an estimate of 31,726 dogs advertised on
 180 gumtree.com.au per year.

181 Most of the dogs on Gumtree were classified as pure bred (n=1361, 51.4%) with 1188 (44.6%)
 182 cross bred dogs, and 103 (3.9%) ads in which it was not clear if dogs were pure or cross bred. The
 183 most common dog breeds advertised on Gumtree and on PetRescue in the same time period are
 184 shown in Table 2. The top two breeds in order for both Gumtree and PetRescue were the
 185 Staffordshire Terrier and Kelpie, representing just over 20% of the total ads for both sources. The
 186 third most common breed for Gumtree was the American Staffordshire Terrier (#4 for PetRescue),
 187 with the Greyhound the third most common breed for PetRescue (#24 for Gumtree). Unlike
 188 Gumtree, approximately three quarters (75.8%) of the ads on PetRescue were for cross breed dogs,
 189 with only 23.8% representing pure breed.

190 **Table 2.** Dog breeds in which 20 or more individuals were relinquished on gumtree.com.au or
 191 petrescue.com.au from February 8 to February 24, 2016 (In 103 dogs the pure breed status was
 192 unknown)

	gumtree.com.au				petrescue.com.au			
	#1	Total	Pure	Cross	#1	Total	Pure	Cross
Staffordshire Terrier	1	325 (12.3)	163 (6.1)	162 (6.1)	1	234 (11.5)	48 (9.9)	186 (12.1)
Kelpie	2	219 (8.3)	119 (4.5)	100 (3.8)	2	181 (8.9)	40 (8.3)	141 (9.1)
American Staffordshire Terrier	3	182 (6.9)	132 (5.0)	50 (1.9)	3	91 (4.5)	14 (2.9)	77 (5.0)
Bull Arab	4	135 (5.1)	37 (1.4)	98 (3.7)	7	74 (3.7)	7 (1.4)	67 (4.3)
Border Collie	5	120 (4.5)	64 (2.4)	56 (2.1)	5	85 (4.2)	11 (2.3)	74 (4.8)
Mastiff	6	103 (3.9)	28 (1.1)	75 (2.8)	9	64 (3.2)	4 (0.8)	60 (3.9)
Rottweiler	7	101 (3.8)	73 (2.8)	28 (1.0)	15	37 (1.8)	7 (1.4)	30 (1.9)
German Shepherd	8	98 (3.7)	74 (2.8)	24 (0.9)	12	50 (2.5)	24 (5.0)	26 (1.7)
Siberian Husky	9	87 (3.3)	66 (2.5)	21 (0.8)	19	25 (1.2)	18 (3.7)	7 (0.5)
Great Dane	10	77 (2.9)	26 (1.0)	51 (1.9)	13	50 (2.5)	10 (2.1)	40 (2.6)
Labrador	11	75 (2.8)	34 (1.3)	41 (1.6)	10	64 (3.2)	17 (3.5)	47 (3.6)
Cattledog	12	71 (2.7)	45 (1.7)	26 (1.0)	6	84 (4.1)	9 (1.9)	75 (4.9)
Bulldog	13	62 (2.3)	52 (2.0)	10 (0.4)	N	0	0	0
Chihuahua	14	55 (2.1)	39 (1.5)	16 (0.6)	16	30 (1.5)	8 (1.7)	22 (1.4)
Jack Russell Terrier	15	53 (2.0)	26 (1.0)	27 (1.0)	8	74 (3.7)	16 (3.3)	58 (3.8)
American Bulldog	16	42 (1.6)	27 (1.0)	15 (0.6)	21	20 (1.0)	1 (0.2)	19 (1.2)
Maltese	17	41 (1.6)	12 (0.5)	29 (1.1)	11	63 (3.1)	9 (1.9)	54 (3.5)
Bull Terrier	18	38 (1.4)	19 (0.7)	19 (0.7)	25	13 (0.6)	6 (1.2)	7 (0.5)
Shar Pei	19	35 (1.3)	18 (0.7)	17 (0.6)	22	20 (1.0)	3 (0.6)	17 (1.1)

Fox Terrier	20	35 (1.3)	21 (0.8)	14 (0.5)	18	28 (1.4)	5 (1.0)	23 (1.5)
Pomeranian	21	31 (1.2)	23 (0.9)	8 (0.3)	23	18 (0.9)	4 (0.8)	14 (0.9)
Malamute	22	27 (1.0)	21 (0.8)	6 (0.2)	26	13 (0.6)	6 (1.2)	7 (0.5)
Blue Heeler	23	25 (0.9)	12 (0.5)	13 (0.5)	27	5 (0.2)	1 (0.2)	4 (0.3)
Greyhound	24	25 (0.9)	23 (0.9)	2 (0.1)	3	109 (5.4)	98 (20.2)	11 (0.7)
Rhodesian Ridgeback	25	24 (0.9)	5 (0.2)	19 (0.7)	17	30 (1.5)	0	30 (1.9)
Maremma	26	20 (0.7)	17 (0.6)	3 (0.1)	28	4 (0.2)	1 (0.2)	3 (0.2)
Irish Wolfhound	27	20 (0.7)	2 (0.1)	18 (0.7)	24	14 (0.7)	1 (0.2)	13 (0.8)
Poodle	28	19 (0.7)	15 (0.6)	4 (0.2)	20	23 (1.1)	10 (2.1)	13 (0.8)
TOTAL		2640	1357	1180		2027 (100)	484	1543
		(100)*	(51.4)	(44.7)			(23.8)	(75.8)

193 ¹ Ranking of breeds from most common to least common; N: not relevant

194 Most dogs on Gumtree were offered by the owner (n=2480, 93.5%) with 172 ads from breeders
 195 (6.5%). The median age for the dogs was 1.42 years, with a range of 0.2 to 14.2 years (n=2640; Table
 196 3). The most common age group was 1 to 2 years (32% of ads), with dogs that were 6 months to one
 197 year of age and two to five years of age both representing 26% of the ads. Dog ages were not
 198 normally distributed, with a right skew; with 10% of the ads for dogs over 5 years of age and 21 of
 199 the ads for dogs of 10 years of age or more. Dogs that were cross bred were advertised at a
 200 significantly lower age than pure bred dogs (2.0 ± 1.9 years versus 2.3 ± 2.0 , respectively; $p < 0.0001$
 201 Mann-Whitney).

202 The median price for each dog was \$AUS200, with a range from 0 to \$AUS7000. Almost
 203 one quarter (n=575, 23%) of dogs were advertised for free, with 43% of dogs advertised for
 204 \$AUS100-499 (Table 3). There were 147 ads in which no price was given. Pure bred dogs were
 205 advertised for a significantly higher price than cross bred dogs ($\$AUS562 \pm 727$ vs $\$AUS198 \pm$
 206 266 , respectively; $p < 0.0001$ Mann-Whitney).

207 **Table 3.** Age and price categories of dogs relinquished on Gumtree from February 8 to 24, 2016

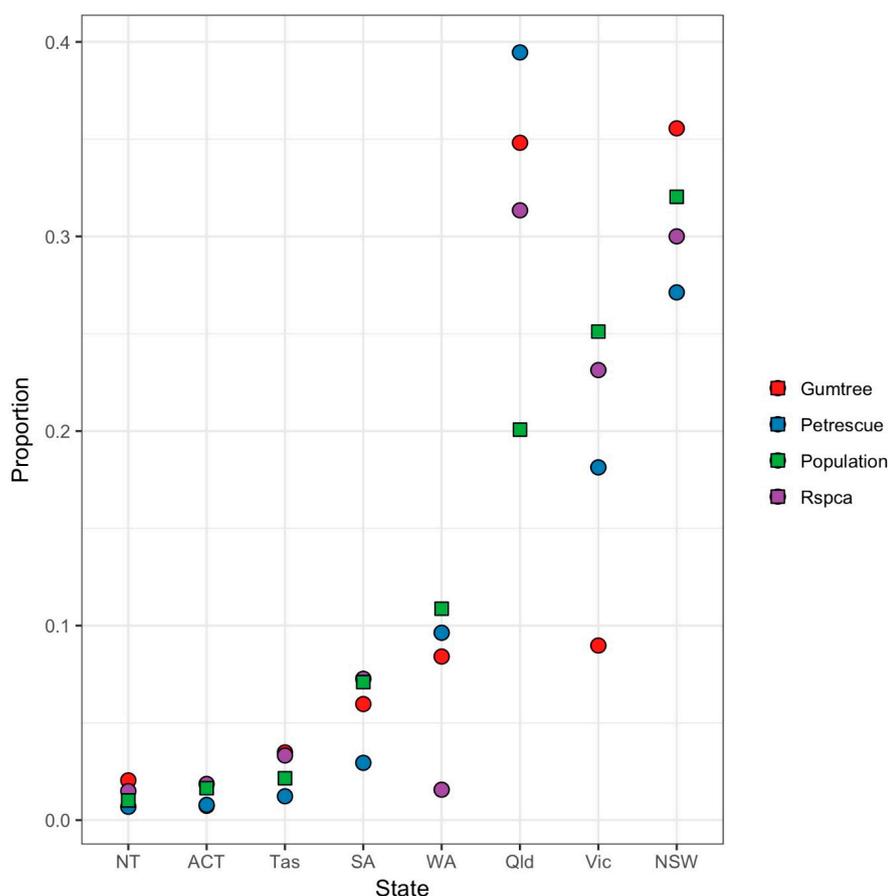
Age Range	N (%)	Price Range (AUS \$)	N (%)
Up to 16 weeks	20 (0.8)	0	575 (23.1)
16 weeks to 6 months	131 (5.0)	1-499	1181 (47.4)
6 months to 1 year	680 (26.1)	500-999	480 (19.3)
1 to 2 years	832 (32.0)	1000-1999	187 (7.5)
2 to 5 years	679 (26.1)	2000-2999	44 (1.8)
>5 years	260 (10.0)	3000-7000	26 (1.0)
TOTAL	2602 (100)	TOTAL	2493 (100)

208 ¹ Tables may have a footer.

209 The majority of Gumtree ads were from NSW (35.6%) and Queensland (34.8%), giving a total
 210 of approximately 70% of all Gumtree ads in Australia coming from those two States (Figure 1). The
 211 proportion of ads from Gumtree and PetRescue and the published figures on dogs surrendered to
 212 RSPCA shelters were compared with the State/Territory human population sizes, using data from
 213 the Australian Bureau of Statistics
 214 ([http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/3ADCB8E8492A9156CA2580](http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/3ADCB8E8492A9156CA25808900122529?opendocument)
 215 [8900122529?opendocument](http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/3ADCB8E8492A9156CA25808900122529?opendocument)). There was a significant difference between the State/Territory human

216 populations and the proportions of dogs advertised on Gumtree ($\chi^2(7) = 566.6, p < 0.0001$),
 217 PetRescue ($\chi^2(7) = 507.4, p < 0.0001$) and the RSPCA ($\chi^2(7) = 7001.2, p < 0.0001$). Compared to the
 218 proportion of the State/Territory human population, there were more ads for Gumtree in
 219 Queensland and NSW and fewer ads for Gumtree in Victoria. Queensland had a higher proportion
 220 of all three (Gumtree, PetRescue and RSPCA) versus the State human population (Figure 1). The
 221 proportions of dogs advertised were significantly different between Gumtree and Petrescue ($\chi^2(7) =$
 222 158.9, $p < 0.0001$).

223 **Figure 1.** Proportions of total ads for relinquished dogs on gumtree.com.au and petrescue.com.au
 224 from February 8 to February 24 2016, and RSPCA shelter admissions for each Australian
 225 State/Territory.



226

227 The prices of advertised dogs in each State/Territory are shown in Table 4. There was a
 228 significant difference in price category between states $\chi^2(12) = 89.7, p < 0.0001$ (data for the ACT was
 229 not included as there were insufficient cases per category for analysis). The highest proportion of
 230 free dog ads was in Qld (34.5%) followed by the NT (31.9%) with the lowest proportion of free ads
 231 in WA (22.3%). The highest proportion of ads for dogs costing >\$AUS500 was in Victoria (47.6%)
 232 with the lowest proportion in Tasmania (16.3%).

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238**Table 4.** Price range (AUS\$) of dogs advertised on Gumtree between February 7 and 26, 2016 and their Australian State or Territory. Percentages represent the proportion of dogs within that State/Territory in each price category.

	\$0 N(%)	\$1-499 N(%)	>\$500 N(%)
NSW	189 (23.2)	420 (50.2)	217 (26.6)
Qld	276 (34.5)	331 (41.4)	192 (24.0)
Vic	51 (24.8)	57 (27.7)	98 (47.6)
WA	43 (22.3)	79 (40.9)	71 (36.8)
SA	39 (28.5)	64 (46.7)	34 (24.8)
Tas	24 (30.0)	43 (53.8)	13 (16.3)
NT	15 (31.9)	22 (46.8)	10 (21.3)
TOTAL	637	1006	635

239 *3.2. Cats on Gumtree*

240 A total of 2093 individual ads identified as cats being relinquished were posted between
241 February 9 and 26, 2016. This included 1353 ads on February 9, 1397 ads on February 19 and 1465
242 ads on February 26. There were 408 new ads on February 19 and 332 new ads on February 26,
243 giving an estimate of 44 new ads per day or 16,060 ads per year (44 x 365). The average number of
244 cats per ad in 50 random ads was 1.51, giving an estimate of 24,250 cats advertised on
245 gumtree.com.au per year.

246 A minority of 508 ads provided any information on whether a cat was a pure or cross breed,
247 with 61% of these pure breed (n=310) and 39% cross breed (n=198). The breeds for which there were
248 at least 15 ads on Gumtree are shown in Table 5 in comparison to cats advertised on PetRescue in
249 the same time period. The Ragdoll and Domestic Shorthair were the most common breeds
250 mentioned in the Gumtree ads, however, Domestic Shorthair and Domestic Medium Hair were by
251 far the most common breeds on PetRescue.

252 **Table 5.** Cat breeds relinquished on gumtree.com.au from February 9 to February 26, 2016 in
253 comparison to those advertised in the same period on petrescue.com.au

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	gumtree.com.au			petrescue.com.au				
	#1	Total	Pure	Cross	#1	Total	Pure	Cross
Ragdoll	1	148	116	32	4	30	24	6
DSH	2	81	0	81	1	1894	0	1894
Bengal	3	37	28	9	12	2	0	2
Persian	4	32	12	20	8	8	5	3
Siamese	5	29	19	10	5	16	15	1
Russian Blue	6	26	14	12	6	12	12	0
Burmese	7	24	19	5	8	8	8	0
British Shorthair	8	16	15	1	9	6	5	1
Manx	9	14	11	3	7	9	9	0
Birman	10	9	9	0	10	5	5	0

Himalayan	11	9	7	2	N	0	0	0
Devon Rex	12	9	7	2	N	0	0	0
Oriental	13	8	5	3	7	9	4	5
Tonkinese	14	8	6	2	11	3	2	1
Domestic Medium Hair	15	7	0	7	2	375	0	375
Maine Coon	16	5	5	0	12	2	2	0
Domestic Long Hair	17	4	0	4	3	38	0	38
Chinchilla	18	4	4	0	13	1	1	0
Sphynx	19	4	3	1	N	0	0	0
Snowshoe	20	0	0	0	11	3	2	1
Australian Mist	21	0	0	0	10	5	1	4
TOTAL		508	310	198		2426	95	2331

255 ¹ Ranking of breeds from most common to least common

256

257 Most cats were offered by the owner (n=2003, 95.7%) with 90 ads from breeders (4.3%). The
 258 median age for the cats was 0.9 years, with a range of 0.0 to 18.2 years (n=2093). The most common
 259 age group was up to 16 weeks (23.6% of ads) with around half of the ads (53%) for cats that were
 260 one year of age or less (Table 6). Cat ages were not normally distributed, with a right skew; 10% of
 261 the ads were for cats over 5 years of age, and there were 9 ads for cats of over 15 years of age. Cats
 262 that were cross bred were advertised at a significantly lower age than pure bred cats (2.2 ± 2.7 years
 263 versus 2.5 ± 2.5 , respectively; $p < 0.01$ Mann-Whitney).

264 **Table 6.** Price and age ranges of kittens and cats sold on Gumtree from February 9 to February 26,
 265 2016. There were 11 ads in which no age was provided and 90 ads in which no price was provided.

Age Range	N (%)	Price Range (AUS \$)	N (%)
Up to 16 weeks	492 (23.6)	0	1298 (62.0)
16 weeks to 6 months	414 (19.9)	1-499	617 (29.5)
6 months to 1 year	201 (9.7)	500-999	73 (3.5)
1 to 2 years	373 (17.9)	1000-1999	13 (0.6)
2 to 5 years	391 (18.8)	2000-2999	2 (0.1)
>5 years	211 (10.1)		
TOTAL	2082 (100)	TOTAL	2003 (100)

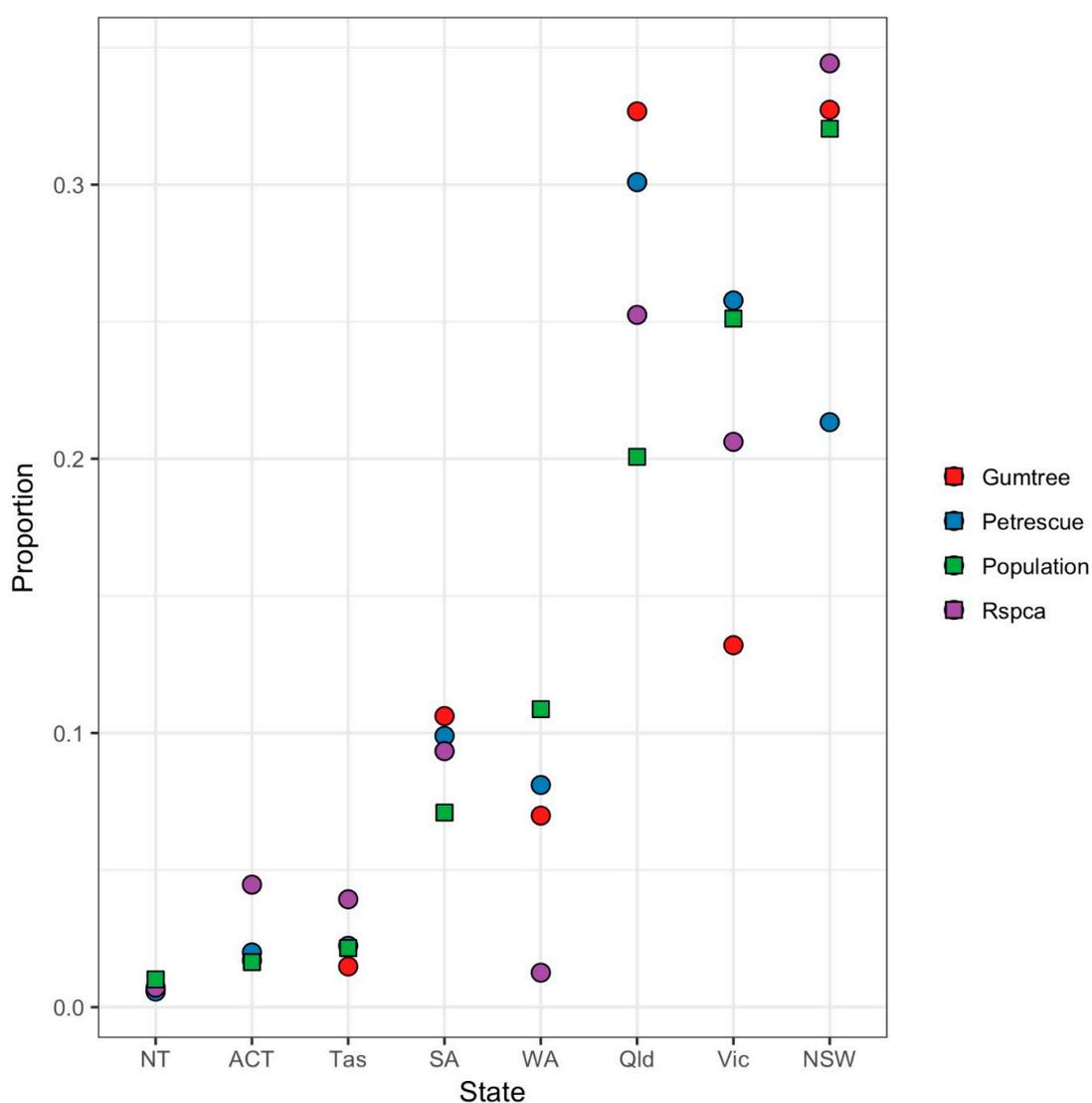
266

267 The median price for each cat was \$AUS0, with a range from 0 to \$AUS2500. Almost two thirds
 268 (n=1298, 62%) of cats were advertised for free, with 30% of cats advertised for \$AUS1-499 (Table 6).
 269 Pure bred cats were advertised for a significantly higher price than the cross bred cats (\$AUS351 \pm
 270 331 vs \$AUS66 \pm 99, respectively, n=508; $p < 0.0001$ Mann-Whitney).

271 The same proportion of cat ads on Gumtree were from NSW and Queensland (32.7% each;
 272 Figure 2). The proportion of cat ads from Gumtree and PetRescue were compared with the
 273 State/Territory human population sizes

274 (<http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/3ADCB8E8492A9156CA2580>
 275 8900122529?opendocument). There was a significant difference between the State/Territory human
 276 populations and the proportions of cats advertised on Gumtree ($\chi^2(7) = 566.6, p < 0.0001$), PetRescue
 277 ($\chi^2(7) = 507.4, p < 0.0001$) and the RSPCA ($\chi^2(7) = 9969.9, p < 0.0001$). In Queensland the proportion
 278 of cats from all three sources was higher than the Queensland human population, while in Victoria
 279 PetRescue and Gumtree represented a lower proportion than the State human population. In WA
 280 Gumtree, PetRescue and the RSPCA were a lower proportion than the human population, while in
 281 NSW only the proportion of PetRescue ads was substantially lower than the State human
 282 population. The proportions of cats advertised was significantly different between Gumtree and
 283 Petrescue ($\chi^2(7) = 158.9, p < 0.0001$). Compared to PetRescue, there were more Gumtree ads in NSW,
 284 SA, Tasmania and the Northern Territory than expected, and fewer ads in Victoria than expected.

285 **Figure 2.** Proportions of total ads for relinquished cats on gumtree.com.au and petrescue.com.au from
 286 February 9 to February 26 2016, and RSPCA shelter admissions for each Australian State/Territory.



287

288

289 The prices of advertised cats on Gumtree in each State/Territory were compared using three
 290 categories: \$AUS0, \$AUS1-499 and >\$AUS500. The data for the ACT, NT and Tasmania were not
 291 included as there were insufficient cases per category. There was a significant difference in price
 292 category between states $\chi^2(8) = 38.6$, $p < 0.0001$. The highest proportion of free cat ads came from
 293 Victoria (77%) and SA (67%) with the lowest proportion of free ads in WA (54%; Table 7). Victoria
 294 had a lower proportion of Gumtree ads for cats \$AUS1-499 (16% vs >30% for other States), and the
 295 highest proportion of ads for cats costing >\$AUS500 (7%). The proportions of Gumtree ads for cats
 296 >\$AUS500 was low overall (3-7%).

297 **Table 7.** Price range of cats advertised on Gumtree between February 7 and 26, 2016 and their
 298 Australian State or Territory. Percentages represent the proportion of cats within that State/Territory
 299 in each price category.

	\$0 N(%)	\$1-499 N(%)	>\$500 N(%)
New South Wales	356 (62.2)	190 (33.2)	26 (4.5)
Queensland	366 (64.3)	183 (32.2)	20 (3.5)
Victoria	178 (77.1)	36 (15.6)	17 (7.4)
Western Australia	65 (53.7)	50 (41.3)	6 (5.0)
South Australia	125 (67.2)	56 (30.1)	5 (2.7)
TOTAL	1090 (64.9)	515 (30.7)	74 (4.4)

300 3.3. Interviews

301 Most interviews took place on the phone (n=11), with four people emailing back a survey.
 302 There were 15 responses in total, a response rate of 2.5% (8/324) for dogs and 2.3% (7/299) for cats.
 303 In addition, 16 people responded to the email to notify that they would not be involved, giving
 304 reasons such as not having time, or that the situation was too distressing.

305 There was a mix of dog and cat breeds being relinquished by the respondents (Table 8). Five of
 306 the dog owners had desexed dogs, with two dogs entire, and one in which the response was
 307 unclear. All dogs were microchipped, excepting one in which the response to this question was also
 308 unclear. Six dog owners scored a 4/5 (satisfied or highly satisfied) with their dog's health. Five dog
 309 owners also responded on their dog's behaviour, with three of the five highly satisfied and two
 310 giving a 3 or 3.5, i.e. neither satisfied nor dissatisfied. Four of the dogs were originally obtained
 311 online – three from Gumtree and one from tradingpost.com.au. Only one cat was entire, with the
 312 owner not clearly stating neuter status in one other cat. All cat owners were highly satisfied with
 313 their cat's health, but one owner scored their cat's behaviour a 2/5 and another owner 3/5 (Table 8).

314 **Table 8.** Demographic factors for the dogs and cats being relinquished by the 16 people
 315 participating in surveys of why they relinquished their pets on Gumtree (X represents a cross
 316 breed). Responses to the pet's Health and Behaviour were scored on a 1-5 Likert-type scale where 1
 317 was very dissatisfied and 5 was very satisfied. (NS = not stated)

Age (yrs)	Sex	Breed	Neut 1	MC ²	Health	Behav ³	Original source
Dogs							

1	M	Pug x Jack Russell Terrier	NS	NS	NS	NS	Gumtree (rescue)
4	F	Greyhound	No	Yes	NS	NS	NS
1	F	Bull Mastiff X	No	Yes	5	NS	Gumtree
7	F	Siberian Husky	Yes	Yes	4	3-3.5	Friend as puppy
6	M/ F	Maltese/Maltese X Pomeranian	Yes	Yes	4 & 5	5 & 5	TradingPost
NS	M/ F	Beagle	Yes	NS	5 & 5	5 & 5	Gumtree (rescue)
4.5	M	Jack Russell	Yes	Yes	5	3	Registered breeder
1.5	M	American Staffordshire Terrier	Yes	Yes	5	5	Unregistered breeder
Cats							
1	M	Ragdoll X	Yes	Yes	5	5	Gumtree
0.33	F	NS	No	Yes	NS		Gumtree
4.5	M	DSH	Yes	Yes	5	2	Family litter
3	M	British Shorthair	Yes	Yes	5	5	NS
2	M	DSH	Yes	No	5	NS	Family with 2 Ragdolls
0.92	M	Ragdoll	Yes	Yes	5	3	Family
NS	NS	DSH	NS	NS	NS	NS	Strays

318

¹ Neutered; ² Microchipped; ³ Behaviour

319

320 There were a variety of reasons given for relinquishment of the dogs and cats (Table 9). For the
 321 eight dogs, the most common reasons were that they had rescued the dog and needed to find a new
 322 home for it (n=2), and the behaviour of the dog (escaping in one dog and too interested in nearby
 323 livestock in another). For two dog owners, two reasons were provided for the relinquishment, in
 324 the other six cases, a single reason was provided. For the seven cats, the most common reasons for
 325 relinquishment were that the pets in the house were not getting on (cats in two cases and a dog in
 326 one case), and moving (n=2). For three of the cat owners, two reasons were provided for the
 relinquishment, in the other four cases, a single reason was provided.

327

328

Table 9. Reasons for relinquishment given by dog and cat owners advertising their pet on gumtree.com.au

Dogs	N	Cats	N
Rescue	2	Dog/cat not getting on	3
Behaviour	2	Moving	2
Dog injury (working dog)	1	Rescue	1
Own health	1	Allergy	1
Money	1	Expecting a baby	1
Relationship breakdown	1	Too many pets	1
Moving	1	Time	1
Time	1		

329 When asked the reason for using Gumtree rather than other places, the most common reason
 330 for the dog owners was that they believed the shelters were full (n=4) and that they wanted to
 331 see/interview the new owner of their dog (n=2; Table 10). The cat owners chose Gumtree as they
 332 originally got the cat on Gumtree (n=2), because they use Gumtree for other things and it works
 333 (n=2) and to see/interview the new owners of their cat (n=2). There were three dog owners and four
 334 cat owners who gave two different reasons to choose Gumtree.

335 **Table 10.** Reasons people gave for choosing to advertise their relinquished pet on gumtree.com.au

Dogs	N	Cats	N
Shelters full	4	Got the animal on gumtree	2
To see/ interview the new owner	2	Use gumtree for other things	2
Lack of knowledge of shelters	1	To see and interview the new owner	2
It worked before	1	It worked before	1
Shelter is last resort	1	Shelter is last resort	1
Immediate posting and quick response	1	Would be put down at a shelter	1
Would be put down at a shelter	1	Shelter too hard on pet	1
		Don't drive so can't get to shelter	1

336 Relinquishing owners were also asked about the success of rehoming their pet on
 337 gumtree.com.au. Of the eight dog owners, three had successfully rehomed their dog at the time of
 338 completing the survey, and another owner had a prospective re-home organised. In one of the
 339 successful re-homings, the owner had carried out two failed trials with the dog, with a third trial
 340 being successful. For one dog owner there had been two responses with neither suitable, and in
 341 another there had been so many responses that they had had to take the ad down, although none
 342 had been successful at the time of the interview. In another two dog owners there had not yet been
 343 any responses. For the seven cat owners, one person had had 50 offers for the cat within ten
 344 minutes, and another had two potential homes within one day. Both of the cats in these examples
 345 were pure breeds. In another two cat owners there had been a single response, the three remaining
 346 owners had not yet received responses.

348

349 4. Discussion

350 The current study provides evidence about the numbers and types of dogs and cats
 351 relinquished on one popular website (gumtree.com.au) in Australia, filling an important gap in
 352 knowledge. It indicates that thousands of dogs and cats are being relinquished on gumtree.com.au
 353 per year. Information collected on their breed and age profiles allows comparison with other
 354 relinquished populations on petrescue.com.au and published RSPCA data. Although there are
 355 similarities between the populations, such as the most common dog breeds on gumtree.com.au,
 356 petrescue.com.au and in published RSPCA figures, there also appear to be differences suggesting
 357 pets relinquished on gumtree.com.au represent a sub-population of relinquished animals.

358 By extrapolation, the total number of dogs and cats relinquished via Gumtree ads was
 359 approximately 30,000 and 16,000, respectively. Recent estimates have indicated that 211,655 dogs
 360 were admitted to shelters and municipal facilities in Australia in 2012-13 [2]. Some of the dogs
 361 being offered on Gumtree may eventually be relinquished to a shelter or end up at a municipal
 362 pound if a new owner is not found. The estimated Gumtree ads represent a significant proportion

363 (~14%) of the total number of dogs admitted to shelters and municipal facilities per year. This
364 proportion would be even higher if one considered other online websites (e.g. DogzOnline,
365 TradingPost), as well as Facebook®, and other private or closed websites advertising pets. The
366 diverse and diffuse nature of online ads, as well as the fact some are closed websites, makes it
367 impossible to estimate the total numbers of pets advertised online. If it is also considered that less
368 than half of shelter relinquishments are owner surrenders (19% in dogs to Queensland RSPCA
369 shelters in 2014 and 32% of cats between 2006 and 2009 in Queensland RSPCA shelters; [18,23]) then
370 the online ads would represent an even higher proportion of owner surrenders.

371 There is a complex flow of dogs and cats between the owned and un-owned populations. The
372 data presented from the gumtree.com.au ads, from petrescue.com.au (representing larger and
373 smaller shelters and pounds) and from published data from the RSPCA, illustrate the complexity of
374 movements of surrendered dogs and cats within and between Australian States/Territories. The
375 human population for each State/Territory was used for comparison; if one assumes that a similar
376 percentage of people in each State/Territory own a dog or cat, the human population is a proxy for
377 the dog and cat population. If one then assumes that a similar proportion of dog and cat owners in
378 each State/Territory relinquish their dogs or cats each year, the proportions should be similar. In
379 fact they were not, and this may be because these two assumptions are not true, and that people in
380 different States/Territories are more or less likely to own a dog/cat and to then relinquish it. In
381 general, Queensland had an overrepresentation of the surrendered population of dogs and cats on
382 Gumtree, PetRescue and the RSPCA compared to their human population, while Victoria tended to
383 have an underrepresentation of relinquished dogs and cats compared to their population. An
384 additional confounder is that RSPCA data is dependent on the numbers and sizes of shelters in each
385 State/Territory, and the petrescue.com.au data depends on the market penetration of
386 shelters/pounds using their website from each region. Internet access and hence access to Gumtree
387 may be more uniform between States. To fully understand the flow of owned and un-owned dogs
388 and cats within and between regions of Australia will require further research.

389 Although there were similar total numbers of ads for dogs and cats on Gumtree, there were
390 fewer new ads posted in the follow-up data sets for cats versus dogs. This suggests the turnover of
391 cat ads on gumtree.com.au is longer than for dogs. Of the dog and cat owners that were
392 interviewed, a higher proportion of dog owners had already successfully rehomed their pets versus
393 the cat owners, at the time of interview. Of the two cat owners who had multiple responses for
394 relinquishment, and had been able to successfully rehome their pets, both were pure bred cats.
395 However, the very small number of responses from owners relinquishing their pets on
396 gumtree.com.au means that this data is not likely to be representative of the entire population of
397 relinquishing owners.

398 There are many risks involved with online trade in pets for both prospective owners and
399 animals, but as yet online sales of dogs and cats remain unregulated around the world. In some
400 countries voluntary standards for online sales of pets have been developed, with the Pet
401 Advertising Advisory Group (<http://paag.org.uk/>) in the UK, the Irish Pet Advertising Advisory
402 Group (<http://ipaag.ie/>) and the BelgPAAG (Belgian Pet Advertising Advisory Group) was recently
403 launched in Belgium [24]. The EU Dog & Cat Alliance released a report into the cost of online sales
404 in the EU recently [25]. The main findings were that online ads are now the most common way for
405 people to purchase a pet, that there are no regulations around Europe that cover this trade, and the
406 many risks involved. These include sale of unweaned animals and animals in poor health. There are
407 up to 269,620 dogs and 67,847 cats estimated as being advertised online in the European Union on
408 any given day [25]. A report issued by BBB® International Investigations Initiative presents
409 evidence on how online pet sellers scam pet buyers in the US [26]. The BBB ScamTracker contained
410 907 reports on pet scams at the time the report was published, which was 12.5% of all online
411 purchase fraud complaints. Many of the scams do not involve a real animal, for example an ad for a
412 free dog or cat that urgently needs a new home may be posted. Once a person responds to the

413 advertisement, costs relating to transportation and care of the animal are requested. The report
414 includes information from other countries, with 337 pet complaints to the Australian Competition
415 and Consumer Commission in the first six months of 2017, and 377 complaints involving animals to
416 the Canadian Antifraud Centre in 2016, with estimated losses of \$222,000 [26].

417 In addition to the risks relating to online sales of dogs and cats outlined above, there are other
418 risks relating specifically to dog and cat relinquishment. If an aggressive dog is relinquished to a
419 reputable shelter, the dog's behaviour will be assessed and the risk to new owners evaluated.
420 Although behavioural assessments performed in shelters are unreliable [27], prospective owners
421 can be educated on the behaviour of the dog and triggers of aggression prior to adoption. In
422 addition, good shelters have access to trainers and behaviourists who can implement programs to
423 improve the behaviour of an animal. In some of the ads it was possible to read between the lines
424 and see that aggression was likely to have been a problem (e.g. '*Urgent rehoming needed for Jack
425 Russell cross, male, 10 years. Beautiful dog, very friendly but best suited to a kid free home.*') but there is
426 nothing to prevent owners advertising and selling pets with a behavioural problem without
427 providing any warning or information to the new owner.

428 As well as the risk to new owners, there are also risks to the animals themselves. While not
429 perfect, shelters do question prospective new owners on their ability to look after a pet and may not
430 allow somebody to adopt a pet if they believe it will not be well cared for. Again, there is no
431 obligation when dogs and cats are traded online for this to occur. As people may have ready access
432 to the internet at any time of the day, and with the posting of cute photos, impulse buying may also
433 be a significant problem. The wording of some of the ads indicated an impulse purchase, for
434 example '*6 month old Shar Pei puppy we brought him off gumtree two weeks ago and he's the best puppy
435 ever but unfortunately I have no time for him as I have three babies. He has had all he's (sic) needle are up to
436 date. Looking for a good home with someone who has plenty of time for him.*' An additional risk associated
437 with the Gumtree ads was that a large proportion were free, or a minimal cost. It has been
438 suggested that animals obtained at no or a low cost are at an increased risk of future relinquishment
439 [28], perpetuating the problem.

440 There is also an additional risk associated with offering dogs and cats free, or very low cost.
441 One of the interview respondents discussed how they had been taking home dogs advertised on
442 Gumtree free in order to find them a new home. This respondent felt that otherwise people
443 involved in dog fighting would take them (they had rehomed approximately 80 animals in the past
444 year). To our knowledge, there is no evidence of trade and use of dogs in dog fighting, although it
445 should be considered as a possibility. There were a number of ads describing dogs suitable for pig
446 hunting, which is illegal in some States of Australia [29]. In fact the Bull Arab, which is not a
447 recognised breed by the Australian National Kennel Council [30], is a breed often associated with
448 pig hunting, and a large number of Gumtree ads for Bull Arabs from Queensland (in which pig
449 hunting is legal) were observed. The final risk for dogs and cats advertised free or for low cost
450 online is from animal hoarders. Arluke et al (2017) describe three types of animal hoarders: the
451 overwhelmed caregiver, rescue and exploiter. The rescue hoarder has a missionary zeal to save all
452 animals and actively seeks to acquire animals [31]. Being exposed to advertisements of animals that
453 need rescuing on Gumtree is likely to trigger a rescue hoarder, who can acquire multiple animals
454 free or at minimal cost.

455 It is difficult to determine if the population of dogs and cats surrendered on Gumtree overlaps
456 with the animals that are surrendered to the RSPCA or other shelters. Four of the people
457 interviewed who had relinquished dogs on Gumtree stated that they used Gumtree as the local
458 shelters were full, and while this was not given as a reason by any cat owners there was one person
459 who said they used Gumtree because the cat would be 'put down' at a shelter. The animals
460 advertised on Gumtree would represent the 'owner surrender' dog admissions to a shelter. Only
461 19% of the 11,967 dogs entering the RSPCA in Queensland in 2014 were owner surrender, with 24%

462 classified as strays admitted by the public, and 34% from municipal councils [23]. However, some
463 of the strays admitted by the public may represent owned animals, with owners avoiding paying
464 shelter surrender fees, or not wanting people to know they are relinquishing their own pet. The top
465 four breeds processed by RSPCA shelters in Queensland in 2014 were the Staffordshire Bull Terrier
466 (20%), Australian Cattle Dog (8%), Kelpie (7%) and Bull Arab (7%). The top four breeds advertised
467 on Gumtree in the current study were the Staffordshire Bull Terrier (12%), Bull Arab (8%), Kelpie
468 (6%) and Australian Cattle Dog (5%). Thus the most popular breeds for the RSPCA and Gumtree
469 are similar, and also to the dogs offered on petrescue.com.au which represent both larger and
470 smaller shelters. Despite similarities in the breeds, the proportions of pure and cross breed dogs
471 differ widely, with 92% of the dogs admitted to the RSPCA in Queensland in 2014 being cross bred,
472 while only 46% of dogs from Queensland advertised on Gumtree cross bred. The median price of
473 pure bred dogs was significantly higher in the Gumtree ads than for cross bred dogs.

474 There is an important difference in relinquishing online versus giving up a dog or cat at a
475 shelter. At a shelter, owners may have to pay a fee to relinquish their pets, whereas on an online
476 site, they can request a sum of money. However, based upon the definition of relinquishment being
477 used in this study ('Voluntarily cease to keep or claim; give up') the owners are voluntarily giving
478 up their dog or cat. Indeed, if a dog or cat has been purchased originally for a large sum of money,
479 offering the pet online may allow the owners to make up for some of this loss. The general use of
480 the term relinquishment describes an animal taken to a shelter. When devising the criteria to
481 determine if a dog or cat was being relinquished, we originally planned to have a cap on price for
482 the animals we included in our study. However, when reading the descriptions of the ads, there
483 were ads in which the dog or cat was being traded for over \$AUS1000, and yet the wording
484 suggested that the decision of the owner to relinquish their pet had been difficult. Thus, it was not
485 possible to use a cut-off price and say that all pets below that price were relinquished and above
486 that price were not.

487 One reason provided by respondents for the use of Gumtree for relinquishing their pets was
488 that they could speak to the new owners and see where their pet would live before agreeing to give
489 their pet a new home. One of the owners had even run trials of their dog with the prospective new
490 owners, and had two failed trials before having success with the third. Follow-up and control on
491 the re-homing of their pet is something that cannot be provided in a traditional shelter, where the
492 animal is left and no further information on where, and even if it has been rehomed, is provided. A
493 novel dog adoption program has been suggested in the US which involves placing dogs into foster
494 homes, with the foster carer tasked with finding the dog a new home [32]. There are obvious issues
495 with protection of privacy and the possibility of the new owners being harassed by the previous
496 owner (or *vice versa*), but this feedback is important for shelters to consider. To accommodate
497 owners who want to know where their pet goes and that it is being well looked after, innovative
498 programs should be considered.

499 An important limitation of the current study was the limited number of relinquished owners
500 who responded. Of those who did respond, all would be classified as responsible pet owners who
501 were in positions in which they had no real choice but to relinquish their pet, and who were doing
502 their best to find a good home. One of the respondents had rescued the animal previously from an
503 ad on gumtree.com.au and believed that the owner was going to kill the animal if a new owner was
504 not found quickly (an unavoidable change in this persons living arrangements outside of their
505 control meant that they needed to relinquish the pet). It is likely the population of people
506 relinquishing their pets on gumtree.com.au are mixed, with some doing everything they can to find
507 a good home, and others not caring where their pet goes as long as they can dispose of it. Further
508 research with responses from a larger range of respondents would be difficult, as people who do
509 not care for their pet are also unlikely to respond to requests to participate in research. For the
510 owners who were relinquishing their pets, several were obviously upset about the difficult decision
511 they had been forced to make. It was also interesting that some owners felt it necessary to respond

512 to the email to notify us that they were not willing to participate as they found the situation too
 513 distressing. This aligns with previous research that concluded that rather than giving their pet up at
 514 a shelter thoughtlessly many people struggled with an unavoidable situation and really had no
 515 choice [19].

516 5. Conclusions

517 The present study provides evidence that many thousands of dogs and cats are relinquished
 518 online in Australia each year. This population of pets has previously not been considered in policy
 519 or strategies to reduce the risk of relinquishment and protect the welfare of un-owned dogs and
 520 cats. Knowledge of online relinquishments adds detail to what we currently know about the
 521 complex flow of dogs and cats between owned and un-owned populations, and between different
 522 owners.

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531 References

- 532 1. Animal Medicines Australia, Pet ownership in Australia 2016. Available online:
 533 [http://animalmedicinesaustralia.org.au/wp-content/uploads/2016/11/AMA_Pet-Ownership-in-Australia-](http://animalmedicinesaustralia.org.au/wp-content/uploads/2016/11/AMA_Pet-Ownership-in-Australia-2016-Report_sml.pdf)
 534 [2016-Report_sml.pdf](http://animalmedicinesaustralia.org.au/wp-content/uploads/2016/11/AMA_Pet-Ownership-in-Australia-2016-Report_sml.pdf) (accessed on 11/12/2017)
- 535 2. Chua, D.; Rand, J.; Morton, J. Surrendered and stray dogs in Australia-estimation of numbers entering
 536 municipal pounds, shelters and rescue groups and their outcomes. *Animals (Basel)* 2017, 7.
- 537 3. Clark, C.C.; Gruffydd-Jones, T.; Murray, J.K. Number of cats and dogs in UK welfare organisations. *Vet*
 538 *Rec* 2012, 170, 493.
- 539 4. RSPCA Australia National statistics 2015-2016. Available at:
 540 [https://www.rspca.org.au/sites/default/files/RSPCA%20Australia%20Annual%20Statistics%202015-](https://www.rspca.org.au/sites/default/files/RSPCA%20Australia%20Annual%20Statistics%202015-2016%20.pdf)
 541 [2016%20.pdf](https://www.rspca.org.au/sites/default/files/RSPCA%20Australia%20Annual%20Statistics%202015-2016%20.pdf) (accessed on 11/12/2017)
- 542 5. Hwang, B.R.; A.L., Y.; J.K., H.; J.C., Y.; J., H.; C.K., S.; S.B., J.; S.H., J. Survey on the status of abandoned
 543 animals in Seoul City, 2013. *Global Journal of Medical Research: G Veterinary Science and Veterinary*
 544 *Medicine* 2013.
- 545 6. New Jr, J.C.; Kelch, W.J.; Hutchison, J.M.; Salman, M.D.; King, M.; Scarlett, J.M.; Kass, P.H. Birth and death
 546 rate estimates of cats and dogs in U.S. Households and related factors. *J Appl Anim Welf Sci* 2004, 7, 229-
 547 241.
- 548 7. Stavisky, J.; Brennan, M.L.; Downes, M.; Dean, R. Demographics and economic burden of un-owned cats
 549 and dogs in the UK: Results of a 2010 census. *BMC Vet Res* 2012, 8, 163.
- 550 8. House of Lords 8 February 2012 Available at:
 551 <http://www.publications.parliament.uk/pa/ld201212/ldhansrd/text/120208-0001.htm#12020840000842>
 552 (Nov 10) (accessed on 11/12/2017)
- 553 9. Lambert, K.; Coe, J.; Niel, L.; Dewey, C.; Sargeant, J.M. A systematic review and meta-analysis of the
 554 proportion of dogs surrendered for dog-related and owner-related reasons. *Prev Vet Med* 2015, 118, 148-
 555 160.
- 556 10. Shore, E.R.; Petersen, C.L.; Douglas, D.K. Moving as a reason for pet relinquishment: A closer look. *Journal*
 557 *of Applied Animal Welfare Science* 2003, 6, 39-52.
- 558 11. Reeve, C.L.; Rogelberg, S.G.; Spitzmuller, D.; DiGiacomo, N. The caring-killing paradox: Euthanasia-
 559 related strain among animal-shelter workers. *Journal of Applied Social Psychology* 2005, 35, 119-143.
- 560 12. Anderson, K.A.; Brandt, J.C.; Lord, L.K.; Miles, E.A. Euthanasia in animal shelters: Management's
 561 perspective on staff reactions and support programs. *Anthrozoos* 2013, 26, 569.

- 562 13. Rogelberg, S.G.; Reeve, C.L.; Spitzmuller, C.; DiGiacomo, N.; Clark, O.L.; Teeter, L.; Walker, A.G.; Starling,
563 P.G.; Carter, N.T. Impact of euthanasia rates, euthanasia practices, and human resource practices on
564 employee turnover in animal shelters. *J Am Vet Med Assoc* 2007, 230, 713-719.
- 565 14. German, A. The extent and implications of unwanted cats and dogs. *Vet Rec* 2012, 170, 491-492.
- 566 15. Cozzi, A.; Gazzano, A.; Mariti, C.; Notari, L.; Ducci, M.; Martelli, F. Behavioural changes in sheltered dogs.
567 *Annali della Facolta di Medicina Veterinaria di Pisa* 2007, 60, 241-258.
- 568 16. Schorr-Evans, E.M.; Poland, A.; Johnson, W.E.; Pedersen, N.C. An epizootic of highly virulent feline
569 calicivirus disease in a hospital setting in New England. *J Feline Med Surg* 2003, 5, 217-226.
- 570 17. Pesavento, P.A.; Hurley, K.F.; Bannasch, M.J.; Artiushin, S.; Timoney, J.F. A clonal outbreak of acute fatal
571 hemorrhagic pneumonia in intensively housed (shelter) dogs caused by *Streptococcus equi* subsp.
572 *Zooepidemicus*. *Vet Pathol* 2008, 45, 51-53.
- 573 18. Alberthsen, C.; Rand, J.; Morton, J.; Bennett, P.; Paterson, M.; Vankan, D. Numbers and characteristics of
574 cats admitted to Royal Society for the Prevention of Cruelty to Animals (RSPCA) shelters in Australia and
575 reasons for surrender. *Animals (Basel)* 2016, 6.
- 576 19. Dolan, E.D.; Scotto, J.; Slater, M.; Weiss, E. Risk factors for dog relinquishment to a Los Angeles municipal
577 animal shelter. *Animals (Basel)* 2015, 5, 1311-1328.
- 578 20. Rent Fair Victoria. Available online: <https://www.vic.gov.au/rentfair/pets-are-welcome.html> (accessed on
579 11/12/2017)
- 580 21. Reports. Pet trade demand for pets creates online pet sales epidemic. *Veterinary Record* 2017, 181, 389.
- 581 22. Voris, H.C.; Wittum, T.E.; Rajala-Schultz, P.J.; Lord, L.K. Characterization of advertisements for puppies
582 sold online: Determinants of cost and a comparison with parent club breeders. *Prev Vet Med* 2011, 100,
583 200-209.
- 584 23. Hemy, M.; Rand, J.; Morton, J.; Paterson, M. Characteristics and outcomes of dogs admitted into
585 Queensland RSPCA shelters. *Animals (Basel)* 2017, 7.
- 586 24. EU Dog & Cat Alliance®. Belgium launches new animal welfare initiative to tackle the high risk online sale
587 of pets. 2017.
- 588 25. EU Dog & Cat Alliance®. Available online: [https://www.dogandcatwelfare.eu/news/online-sale-pets-
589 whats-cost/](https://www.dogandcatwelfare.eu/news/online-sale-pets-whats-cost/) (accessed on 11/12/2017)
- 590 26. Bureau(R), B.B. Puppy scams: How fake online pet sellers steal from unsuspecting pet buyers. A BBB
591 study.; September, 2017.
- 592 27. Patronek, G.J.; Bradley, J. No better than flipping a coin: Reconsidering canine behavior evaluations in
593 animal shelters. *Journal of Veterinary Behavior: Clinical Applications and Research* 2016, 15, 66-77.
- 594 28. New, J.C.J.; Salman, M.D.; King, M.; Scarlett, J.M.; Kase, B.A.; Hutchison, J.M. Characteristics of shelter-
595 relinquished animals and their owners compared with animals and their owners in U.S. Pet-owning
596 households. *Journal of Applied Animal Welfare Science* 2000, 3, 179-201.
- 597 29. RSPCA Australia KnowledgeBase. Available online: [http://kb.rspca.org.au/Is-hunting-feral-pigs-with-
598 dogs-legal-in-Australia_295.html](http://kb.rspca.org.au/Is-hunting-feral-pigs-with-dogs-legal-in-Australia_295.html) (accessed on 11/12/2017)
- 599 30. Australian National Kennel Council. Available online: <http://ankc.org.au/> (accessed on 11/12/2017)
- 600 31. Arluke, A.; Patronek, G.J.; Lockwood, R.; Cardona, A. Animal hoarding. In *The Palgrave International
601 Handbook of animal abuse studies*, Maher, J.; Pierpoint, H.; Bierne, P., Eds. Palgrave Macmillan: London,
602 2017.
- 603 32. Mohan-Gibbons, H.; Weiss, E.; Garrison, L.; Allison, M. Evaluation of a novel dog adoption program in
604 two us communities. *PLoS One* 2014, 9, e91959.