

Valued guest or vilified pest? How attitudes towards urban brushtail possums *Trichosurus vulpecula* fit into general perceptions of animals

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ABSTRACT

The brushtail possum is common in Sydney's bushland suburbs, where it is often valued and made welcome. However, some suburban residents do not either value or welcome brushtail possums on their properties. This study probed the attitudes of both groups of people towards the animals and the environment more generally. It was found that amongst brushtail possum lovers, the animals were seen as simultaneously cute and familiar, and as emblematic of endangered Australian wildlife and natural environments in general. People who did not like or value brushtail possums expressed attitudes in accordance with a dominionistic value system.

Unlicensed trapping of brushtail possums was reported and the existence of a pool of privately owned traps was confirmed. Brushtail possums were reported to have been transported to nearby parks or bushland areas. Usually no provisions for food and water were made while the animal was in the trap. It was known by unlicensed trappers that relocated animals are not thought to fare well but this did not deter them.

Linkages were demonstrated between peoples' underlying values and their attitude and behaviour towards brushtail possums. It is suggested that if change is to be effected then education also needs to target underlying values and attitudes towards animals and the environment rather than just filling fact voids.

Several instances of severe ill-treatment of brushtail possums were disclosed during the study which may indicate further attention to legislative provisions and management options is required.

Key words: marsupial, brushtail possum, urban wildlife, wildlife conflicts, human attitudes, qualitative analysis.

Introduction

The common brushtail possum *Trichosurus vulpecula* is an arboreal marsupial of the family Phalangeridae (Kerle 2001). It is a solitary, predominantly herbivorous, nocturnal animal reaching between 1.5 and 4.0 kg in weight (Menkhorst and Knight 2004). Previously widely distributed, the brushtail possum has disappeared from more than half of its previous range (Goldingay and Jackson 2004), and is now known to be common only in Tasmania and other islands such as Kangaroo Island, Magnetic Island (Isaac 2005) and in some cities (Matthews *et al.* 2004). In New Zealand, to which it was introduced, it is now considered a major pest (Montague 2000). Habitat loss and disturbance, introduced predators and disease are thought to have been responsible for the Australian population declines (Kerle 2001, Goldingay and Jackson 2004).

In 1992, after state wide estimates, the brushtail possum population was thought to be either between "10,000 – 100,000" or "greater than 100,000" (Matthews *et al.* 2004) with the population considered to be in decline.

Eymann *et al.* (2006) cautions that numerous studies on brushtail possums may not be relevant to urban-based populations because many of these studies examined populations subject to different climatic or geographic (e.g. rural, rather than urban) conditions. In addition, the status of the brushtail possum in New Zealand as a significant pest has resulted in a large body of research on the animals within that very different context. Within an urban context, there is a paucity of information on the population biology of brushtail possums, including basic parameters such as sex ratio, age structure, fecundity and mortality.

Ringtail possums *Pseudocheirus peregrinus* are also apparently abundant in some urban areas (Miller *et al.* 1999): however, information about their population biology in urban areas is even sparser. Some urban residents are reportedly unable to distinguish between these two species (Miller *et al.* 1999).

Brushtail possums are usually solitary animals although, in areas of high density, den sharing is not unknown especially between mothers and their female offspring (Kerle 2001).

Individual animals may have several dens and move between them. Breeding occurs in autumn and spring, usually producing a single offspring. However, twinning has been known to occur rarely and these animals have also been known to breed continuously under favourable conditions (Kerle 2001). The young stay with the mother for 8–18 months, when juvenile males are banished from the natal territory. Juvenile females usually occupy the same or neighbouring home range as their mothers (Cowan and Clout 2000, Clinchy *et al.* 2004). Reported home range sizes are between 1–2 ha for females, whereas males tend to have larger home ranges, from 1.2 up to 8.6 ha (Statham and Statham 1997; Harper 2005).

Brush-tail possums are prized wildlife co-habitats for many suburban residents but have a notorious reputation amongst some suburban dwellers (Miller *et al.* 1999; Matthews *et al.* 2004; Eymann *et al.* 2006a). The majority of complaints made against them are that they are noisy, smelly and that they ravage garden plants (Davies *et al.* 2004). These animals have adapted very well to life alongside humans and will readily make their home in a roof cavity where access can easily be gained via loose tiles or open eaves. Brush-tail possums find many garden plants highly attractive as food (deLacey and Chamberlain, 2007). The propensity of brush-tail possums to ‘tap dance’ and fight noisily on house roofs at night is made much of by some householders (Eymann *et al.* 2006). Could this be the view of a relatively small number of highly vocal people, or are brush-tail possums really ‘urban tormentors’ (Matthews *et al.* 2004)?

Urban brush-tail possums live in close proximity to people and their pets and are known to carry a range of diseases including *Toxoplasmosis* (Eymann *et al.* 2006b), *Cryptosporidium*, and *Leptospirosis*, for which the brush-tail possum may be a maintenance host in urban environments (Eymann *et al.* 2007). In addition, brush-tail possums are frequently affected by various skin conditions (Hemsley and Canfield 1994). Although frequently reported by wildlife carers¹, these conditions have not been examined in depth and it is unknown what percentage/extent of the entire population is affected by this condition.

Little information on intra- and inter-species disease transmission routes with regard to urban brush-tail possums is currently available; this is a mostly unexplored field to date. It is important to distinguish between wildlife diseases that potentially have a negative effect on human health and/or their pets and diseases that harm the brush-tail possum and may cause declines in their population numbers. Concerns expressed by householders² that they or their pets are at risk of infectious agents transmitted by brush-tail possums may have some basis, although it is possible that the brush-tail possums are at more risk from the householders and their pets. For example, with respect to *Toxoplasmosis*, Eymann *et al.* (2006b) found

that over 6% of urban brush-tail possums from Sydney had antibodies to *Toxoplasma gondii*. Seropositive animals had a far lower rate of recapture compared to recapture rates for seronegative animals, suggesting that most seropositive animals did not long survive infection. Cats are ultimately the source of *Toxoplasmosis* infection in humans and brush-tail possums; infected cats pass oocysts in their faeces and, in the case of the brush-tail possum, the food of these ground-feeding animals can be thus contaminated, infecting them.

Eymann *et al.* (2006a) presented a synopsis of legislative provisions in the different States relating to brush-tail possums. Briefly, all State agencies encourage a policy of ‘living with possums,’ offering advice on strategies to minimise the impact of brush-tail possums on a property. Within NSW, licences can be obtained solely to remove the animals from the roof, after which they are to be released after sunset on the day of capture within 50 m of the capture site, on the same property (DECC 2008). It is recommended that brush-tail possums are released at sunset on the day of capture because releasing brush-tail possums during the day increases their stress and puts them at risk of being attacked and injured (DSE 2008). In exceptional circumstances, some state agencies allow euthanasia of nuisance animals, for example:

“However, pest controllers can arrange for the destruction of possums on behalf of a landholder only in situations where the landholder has obtained a trap and destroy (destruction) permit from the Department for Environment and Heritage.

Please note that a permit to trap and destroy possums will be granted only if the applicant has tried all other means of resolving the conflict situation.” (DEHSA 2008)

Translocation of brush-tail possums is not a management option because it is known that translocated animals do not fare well; up to 70% of translocated animals die within a week (Pietsch 1994). In addition, translocation of one brush-tail possum merely opens a vacant living space which will be rapidly taken up by immigrant animals (Matthews *et al.* 2004).

Attitudes towards brush-tail possums and wildlife in general are in some circumstances highly polarised (Miller *et al.* 1999, Matthews *et al.* 2004, Davies *et al.* 2004, Temby, 2007). Brush-tail possums tend to be viewed as either a pest, or as valued, welcome wildlife, and possibly potential ‘pets’ (Eymann *et al.* 2006a).

As part of a larger study on urban possum roadkill, Russell (2008 in prep) surveyed all residents within a 20 km grid within the northern Sydney study area. The questionnaire consisted of 21 questions ranging from possum abundance and occurrence to people’s attitudes towards urban possums³. Questionnaires were delivered, along with a return prepaid envelope to every residence

¹ WIRES carers frequently report stress dermatitis in *T. vulpecula*, for example approximately 20% of 555 possums in care between 1997–2004 had stress dermatitis in various stages (L. Millett, WIRES, *pers. comm.*).

² By some anonymous interviewees; see Methods section for an explanation of Ethics constraints.

³ The questionnaire related to both the ringtail and the brush-tail possum

within the grid (N=600). This method gave every resident equal opportunity to respond to the survey. The results indicated that a core of people who do not like possums ('possum haters') exist. Returned surveys (n = 193; response rate 28%) indicated that between 11 and 15 % of respondents clearly did not like possums and thought that possums should not be protected by law. This group did not welcome the animals on their properties, and thought possums should be removed from urban areas. In addition, these respondents strongly disagreed or disagreed with the statement that possums are cute (15%) and would definitely not support possum protection initiatives (11%). In addition to this group of apparent possum haters, one quarter of all respondents strongly agreed with the statement that "*possums are a nuisance*" and one quarter of all respondents either disagreed or strongly disagreed with the statement that "*possums are welcome on my property.*" However, the majority of respondents did agree or strongly agree that possums have a right to exist in urban areas (77%).

Possum haters aside, a high level of concern for possums was demonstrated, with 70% of respondents in agreement or strongly in agreement with the statement that "*I enjoy living with the wildlife in the area including possums,*" and a similar proportion of respondents strongly disagreeing with the statement that "*Possums should be removed from urban areas.*" There was a high level of awareness (60%) that possums were vulnerable to being killed on the roads and that in fact possums often were killed (ca. 60%). When presented with the statement that "*Possums are cute*" 63% of respondents agreed or strongly agreed, whereas 15% of respondents disagreed or strongly disagreed.

Two striking findings from Russell's data, which merit further consideration, are as follows. Firstly, there is a widespread belief that possums are "*cute.*" In the light of a similarly-sized group of people who enjoy living with wildlife (70% of respondents), this indicates that further investigation in order to tease out what qualities of the wildlife people actually enjoy is warranted. Secondly, given that a proportion (11-15%) of respondents perceived possums as a nuisance and did not welcome them on their properties, and a smaller proportion of respondents did not think possums were deserving of legislative protection and would not support initiatives to protect possums, further investigation in order to explore some of the reasons why people held these opinions was undertaken.

This study attempted to find out how people on both sides of the divide viewed brushtail possums; what it was about the animals that was admired or disliked; how people were prepared to treat these animals; and, tentatively, to relate these findings to participants' wider views of native animals and the environment. This was attempted via Qualitative Analysis of interview transcripts and other relevant textual materials.

Methods

Qualitative analysis describes a range of methods commonly used in the Social Sciences. Qualitative analysis takes, as its data, textual materials (see for example Gibbs 2002, Morse and Richards 2002). Because words express

our world views, analysis of textual sources allows the researcher to gain insights into participants' attitudes and underlying values. Qualitative analysis requires an interpretative and contextual approach and sensitivity to detail and context, rather than a reductive (e.g. to numbers, graphs or statistics) approach. In contrast to semi-qualitative and quantitative approaches (surveys etc) qualitative analysis measures "analogue" (open-ended and continuously variable) signals rather than "digital" (on/off; yes/no) responses. The aim of qualitative analysis is to find out what is thought and believed by the individuals concerned rather than to generate data along the lines of "...98% of people agree (with the researcher's statement) that..." Such work has its uses but should not be confused with the present approach, which relies less on large scale replication and more on fine resolution.

Analysis of qualitative data can be used for various purposes; as an end in itself (i.e. purely descriptively) or as an aid to developing material for further discussion. One such further application is Discourse analysis. Discourse analysis works "*outward from texts to an understanding of their contexts, trying to uncover the multiple reasons why the texts are the way they are and no other way*" (Johnstone 2002), thus attempting to relate the words that are used (data) to underlying philosophies and world views. Discourse analysis has been applied both as an attempt to discover what insights a particular paradigmatic outlook might offer on an issue, for example by Gaby (2003), who compared Marxist and Feminist interpretations of materials offered to women undergoing pre-natal genetic counselling, and as an attempt to discover the underlying paradigmatic view point of an existing debate, as by Hadfield (2008). In Hadfield's study, a large number of opinion statements on genetically modified foodstuffs were analysed in order to identify and elucidate the underlying world views of their authors. During the present study, data were also examined from this perspective, with the aim of being able to not just describe attitudes to brushtail possums, but also to comment upon *why* people might have these attitudes and how this might relate to other aspects of their ethic towards the environment and towards animals more generally.

Data generation (interviewing)

The textual materials (i.e. data) in this study were interview transcripts. Obtaining consent, and conducting an interview, is a process requiring a great deal of trust and integrity from both parties. Both interviewee and the researcher stand to lose out in various ways if this trust is broken (for example, if the interviewer disclosed information that got the participant into trouble, or alternatively if a participant decided, as is their right, to withdraw from the project even at the latest stage of writing-up).

As with all types of data, the quality of the data and subsequent analysis are ultimately dependent upon the skills and integrity of the researcher. Interviewing is very demanding and time-consuming, requiring high-level skills on the part of the interviewer, and commitment from both parties. The interviewer in this study (Wilks) has conducted several hundred such interviews and is very experienced in data analysis.

A semi-structured interview is not a 'question and answer' session but a free-ranging commentary by the interviewee on the matter, guided from time to time by questions or comments from the interviewer. Interview transcripts commonly contain a several paragraphs of commentary by the study participant interspersed with one or two-line probes, questions or comments from the interviewer. The interview transcripts in this study ran to between 15 and 35 pages in length.

It is important to recognise that this method does not rely upon statistical analyses for several reasons. The aim of the study was to identify themes and explore and describe these themes, gaining insights into how people viewed the animals and why, rather than to present statements along the lines of "*nine out of ten cat owners who expressed a preference agreed that...*" In this study, the relevant consideration when recruiting interviewees was not statistical e.g. ensuring consistent or minimum sample sizes or demographic matching. The relevant concerns when recruiting (sampling) were questions which could only be answered with confidence during data analysis, such as: Are the full range of attitudes and beliefs being canvassed or is something being missed? (This will frequently emerge from other participants' data, as many interviewees use the interview process as an opportunity to expound their point of view and explain why it is more valid than views held by others). Are the data representative of these attitudes or should further interviewing be undertaken? Is there a 'rogue' individual who may exert additional influences and if so, is this being followed up?

In depth, semi-structured interviews, lasting approximately one and a half hours, were conducted with people holding concerns about brushtail possums. Interviewees were selected by several means. Some interviewees had already participated in previous studies (Eymann 2006, Wilks 2007, Russell 2008 *in prep*); these were mostly people who enjoyed having possums on their properties. Interviewees who disliked brushtail possums were selected via word of mouth (from the above participants) and then via snowballing⁴. WIRES⁵ members who had been or were involved in caring for brushtail possums were also interviewed. 'Saturation' (Glaser and Strauss 1967, Gibbs 2002) was reached after approximately 25 interviews, i.e. the point where the data were not telling anything new. In addition, approximately 20 shortened, 'semi-formal' interviews were conducted in order to confirm saturation.

Ethics

This study was subject to Ethics clearance granted by Macquarie University Human Ethics Committee, subject to conditions, which have been strictly adhered to in all respects. These conditions included: ensuring secure storage of data, limiting access to the data to the researcher and

the research supervisors only, obtaining written, informed consent, and the provision of an appropriately worded explanation of the project and how the participant's involvement and information would be handled. A key condition of the Ethics clearance was the requirement that interview participants' identities would not be disclosed under any circumstances. The data were de-identified and reported in such a manner that it is not possible to discover or infer a person's identity, nor to attribute comments to a particular person. There are several justifications for these restrictions. Some of the data were extremely sensitive and in some cases the pool of interview participants was relatively small. If confidentiality was not ensured, participants could potentially be placed at risk: for example, a participant could be at risk of prosecution if evidence of unlawful activities (e.g. poisoning possums) were discovered or disclosed.

Findings

Throughout the analyses and discussions it has been made clear within the text who the speaker is, for example; 'one possum lover commented that...' Direct quotes of interview data are in italics, which is standard practice when dealing with data of this nature. During data analysis, the data were organised into common themes and this structure has ordered the following discussion.

The data confirm that very strongly-held attitudes towards possums exist. For brevity, the voices are divided into either 'possum lovers' or 'possum haters'⁶. All interview participants in this study were able to distinguish between the brushtail and the ringtail possums and hereafter, the term 'possum' refers to the brushtail possum unless otherwise stated.

Ethic of the environment

Upon detailed examination, it was clear that the attitudes of those people who disliked having possums on their properties related more closely to their ethic towards the environment than to their feelings about the animals concerned. Among the interviewees, a prominent difference between people who liked having possums around (possum lovers) and people who viewed them as unwelcome pests (possum haters) was seen in their stated ethic towards the environment. Possum lovers tended to express beliefs that European settlers, having altered the Australian environment, should therefore be doing all they could to mitigate the adverse effects human occupation was having on the wildlife. As one interviewee explained:

"I mean, they were here first, the possums. We were the ones who invaded their territory so I think it's just fantastic that they're still around, they haven't left... I think it's nice to hear dump-dump-dump-dump over your roof, you know that there's something out there that's alive, it's great...."

⁴ Asking early participants to make referrals to other potential study participants.

⁵ WIRES (Wildlife Information and Rescue Services) is the largest wildlife rescue and rehabilitation group in Australia. Its mission is to rescue and rehabilitate injured native wildlife and to promote awareness of native wildlife and its requirements through research and education www.wires.org.au

⁶ Possum 'lovers' or 'haters' used for purposes of brevity. Most 'possum haters' expressed an extreme dislike of possums when on their property but had less strong feelings about possums elsewhere although some professed to hate all possums, everywhere.

I just think it's a real privilege that we share the environment with them..."

That human interventions, for example by providing additional nest sites and supplemental feeding, might have increased possum population numbers above that which might be supported by the same area of undisturbed environment was seen as irrelevant. For possum lovers there was some sense that the possum was emblematic of Australia wildlife, which in general had been badly disadvantaged by human activities:

"We've lost our bandicoots, we've lost most of our gliders. So possums really are all that we have left to appreciate....."

Sydney was once bushland. This once belonged to them. And we talk about the dispossessed being...Aboriginal people. Well, we also dispossessed all our native animals, and when we've got one in our back garden we act like there's some sort of intruder...it was once bushland, so when there's a possum in my roof or where ever, the possum could be saying: I got no trees any more..."

Possum haters mostly did not mind the possum existing, and did not dislike the animals themselves but thought they should be confined to 'their,' i.e. the designated 'wild,' part of the environment. Perhaps surprisingly, although some people within the possum hating group had moved to bush land suburbs specifically to be close to 'nature'/national parkland, there were expectations that the possums would keep to the reserve (wild) side of their garden fences.

Possum lovers expressed incredulity that other people would move to bush land settings and then expect wildlife to respect their property boundary, because for these interviewees, their wish to be near or in 'wild' settings included a wish to observe and/or interact with wild animals and birds.

Strong underlying dominionistic beliefs about the nature of control, property and ownership were expressed by some respondents; they, as owners of their properties, should be able to make the decision over how their properties would exist, in what state, and what species would live there:

"This is my bit of Australia, and possums are not welcome here!"

Concepts that humans could make the choice to exert control over their environment were not limited to possum haters. Some possum lovers described efforts they were making to 'restore' the environment by planting native plant species rather than exotic species, with the specific aim of making their immediate environs more attractive to native fauna and avifauna.

More than half of all the respondents talked about the 'balance of nature.' Possum haters tended to talk about this concept as something which could be upset, by for example, their neighbours feeding urban possums:

"...there's a critical mass of wildlife which can be sustained by the green areas that are around here. If we start feeding the wildlife there'll be more wildlife than that area can sustain."

I don't think we should feed the wildlife at all..."

When invited to explain the 'balance of nature,' possum hating respondents tended to frame this concept in terms of there being a need for humans to intervene using control measures to keep numbers down (i.e. fencing, trapping) to maintain this 'balance.' To possum lovers, if the balance of nature was upset, it was because of past human actions and it was necessary to remediate in positive ways e.g. feeding wildlife, providing nesting sites, or increasing the area of 'natural' bushland available to them by planting native species in their own gardens.

Concrete concerns on the part of possum haters about the possum as a pest related to potential and actual property damage (for example by ingress to roof cavities), noise and nuisance concerns (e.g. jumping on the roof, or excreting in ceiling cavities) and damage to prized garden plants. Perhaps consequent to ethics of ownership and control, it was felt by possum haters that they should be able to plant ornamental shrubs or fruit trees in their gardens and enjoy the fruits and flowers without fear of losing them to the depredations of wild animals. It was explicitly expressed by several respondents that damage caused by possums to garden plants was perceived as wanton damage to things in which the owners had invested significant time and money; these people felt that their efforts had been vandalised by the animals.

Tolerance of other species

It was clear that not all native wildlife was equal in the eyes of most interviewees. Some possum lovers extended their practical support and respect for wildlife to less 'desirable' creatures such as spiders, snakes, birds which can become destructive, and some even to non-native species such as Indian Mynahs. However, most interviewees, including the majority of possum lovers, drew a line when faced with venomous snakes or spiders, usually citing fears for their children or grandchildren, (one elderly lady demonstrating very gleefully how she wielded her shovel), although some conceded this was inconsistent with their feelings about native wildlife in general.

Possum haters tended to have little ambiguity in their attitudes towards animals. If a spider or a snake was killed it was because they believed this animal had no right to be in a human domain. Other animals were treated strictly according to the value associated with their 'place' in the world. Therefore, the dog's job was to bark at strangers: the cat's, to eat rats and mice: beautiful native birds, to look pretty in their gardens: cattle and sheep, to be raised and eaten by people: and possums, to stay out of their properties.

Are possums cute?

Certain aspects of the possums' appearance and behaviour were referred to frequently by both possum lovers and possum haters.

Possum lovers frequently referred to a few particular, key attributes of the animal that they admired. The animals were said to be "...cute," "...ingenious," and "...clever." Particular attributes (their large eyes and human-like "hands") were referred to repeatedly by possum lovers, for example, when asked why he thought possums are so likeable, one respondent waxed lyrical:

“...they’ve got beautiful eyes and have dexterous fingers... but I like their tails too...their ears too, I think their ears are really quite nice, quite cute...”

These sentiments were acknowledged to be powerful even by some possum haters:

“...they get the sympathy vote because...they’ve got big, lovely eyes and (laughs) sharp teeth and they’ve got wicked claws too...”

and:

“I suppose their little hands and the way they can dissect food...they’re pretty cute yeah, cute to look at- ten feet away.”

However, some possum haters saw the animals as: *“...oversized rats...filthy creatures...”* and mentions were made of individual animals that had been perceived to be diseased. Some people expressed fear that the animals would hurt them by biting or scratching.

Possum lovers can be tentatively further divided into people who valued the animal for its wildness and uniqueness and those who had some degree of sentimental involvement with it including the wish to make some kind of ‘tame’ pet of it. Instances of *de facto* pet status were reported; animals which had as juveniles enjoyed the free run of the house, been tame enough to have been picked up and handled, for whom provision for feeding had been made when the humans were absent, and who had been expected to remain with their human throughout the animal’s life span. However, these attempts failed when the animal concerned reached sexual maturity.

Ill treatment and animal welfare

Several instances of practices which raise animal welfare concerns were disclosed by interview participants, including the practices of some possum lovers. While the Ethics clearance provided specifically for anonymity, some interviewees may have still been inhibited by the knowledge they were disclosing illegal behaviour; for example, one interviewee fully disclosed his habitual means of dispatching possums he caught on his property (transport elsewhere for use as target practice) only after the tape was turned off and the interviewer was walking to her car.

There is a pool of privately owned traps amongst some Sydney householders, in some instances available for loan to relatives and friends. Enquiries of suppliers confirmed a steady trade, at approximately AUD150.00 each, with a seasonal spring peak. Trap owners did not believe that the legal requirement to re-release trapped possums within 50 m of the capture site was an effective way to deal with ‘nuisance’ animals and wished to relocate animals. Owning a trap was seen as a way to circumvent licensing requirements because it was believed that if no record of a ‘nuisance’ possum existed (via a licence application) then the trapper was more likely to be able to escape detection when illegally relocating possums.

Most commonly, possums were reported to have been transported to a nearby park or bushland area and released from their trap:

“You leave a trap out for a couple of nights and check it every morning. And then oops, there’s another one and so off we go. I just pop them in the boot and take them to (place name omitted) and let them go... last year we caught 15 and that didn’t even make a dent in it...”

Usually no provisions for food and water were made during the time the animal was in the trap.

One respondent reported having attempted to poison a possum that habitually used part of her garden. This interviewee was extremely distressed when the poison was accidentally ingested by her pet dogs, because the animals began having painful seizures and their veterinary treatment cost several hundred dollars, and the possum was still resident. She then sought information from the interviewer as to how in the future, possum poison could be placed in ways such as to safeguard the dogs. Additional information, for example *“...my neighbour trapped one under the Barbie lid and turned the gas on...”* or; *“...he dropped the trap into the pool and drowned it...”* was disclosed although this may be less reliable than first hand accounts.⁷

Post-interview, in these and similar instances where actual or potential animal cruelty issues arose, information was given by the interviewer to the interviewee regarding both legislative and animal welfare provisions.

Possum lovers also reported practices likely to be detrimental to the animals’ welfare, including offering inappropriate foodstuffs, encouraging the animals to enter their houses, and petting and stroking joeys:

“...the youngest, even in the pouch, they will take food out of my hand. I try to touch them... Sometimes the old guy will walk down to the door on the balcony and he’s actually rattled the glass when he’s seen me in the room, thinking I’ve totally forgotten the tidbits, and when I’ve opened the door he’s stood up and come in sniffing, looking for the handouts...”

Provisions to feed the possums were made by some possum lovers if they were planning to go away because it was recognised that the possums were dependent upon this human supplied food:

“The children are usually here or someone to put a little bit out. They never have a dry spell, a totally dry spell...If any thing happened to me and our supply of food stopped coming they would be in dire straits.”

One report from a possum lover involved the traumatic death of a young male which had been treated as a pet and which may have been unable to disperse due to dependence upon human feeding:

“...he would let me touch him, stroke his tail, wouldn’t flinch, you could stroke his tummy, he would grab my finger... so gentle, and in the end, he’d hop on my shoulder and take some food.”

⁷ Although it is possible some of this information related to interviewees’ actual practices, relayed in the third person due to concerns about anonymity.

He died...we didn't see him for a couple of weeks and then we found him in the back yard under the wood pile, I picked him up and his skin was all lumps and bumps and he had all sorts of scars...he'd probably been attacked by other males because I guess he was being fed by us and he would have been kicked out by his mother or his father to go and find his own territory and I guess he'd become too dependant on us...

We buried him underneath the tree where he used to feed, but that was really upsetting, we were really upset...

Conflicts

Conflicts between neighbours sometimes arose over the supplemental feeding of possums. People who offered food to possums generally felt that as they were only offering small enticements in order to encourage animals to come and be seen by the humans, then it was OK to continue. In some cases, supplemental feeding had encouraged occasional visits from at least ten different individuals, some visiting daily, others less frequently. Such practices were strongly condemned by some neighbours, who felt that by offering additional food, the population of possums in the area was being artificially increased.

"I know the lady next door doesn't like them because I've heard her next door, when we were out feeding the possums, I've heard her making comments "oh they're feeding the bloody possums again! I wish they wouldn't do that."

Knowledge

In general both possum lovers and possum haters involved with this study showed reasonable levels of knowledge about the biology and habits of brushtail possums. A very great deal of expertise regarding preferred food sources and how these preferences might vary throughout the year was expressed by both possum lovers and possum haters. Some possum haters had become well versed in the food choices and habits of the brushtail possum as prerequisite knowledge to dispatching them: by choosing food favourites of brushtail possums as a lure/bait, trapping success can be optimised.

The legislation relating to possums appears to be not well understood and was perceived to be ineffective by almost all interviewees. As noted above, instances of illegal relocation and destruction of possums were reported and there is evidence that substantial numbers of privately owned possum traps exist, as a means to circumvent legislative requirements for licensed use.

Most respondents were aware that relocated animals are not thought to fare well but this was not a significant factor to those who had engaged in relocations.

Post-interview, the legislative requirements were explained to interviewees where appropriate: to which the most

common response was to the effect that this would not alter their practices in the future although some respondents commented that they would take more care in the future to be discreet in order to avoid detection.

Discussion

In contrast to some other studies in this area (Miller *et al.* 1999), there was no strong association between 'negative' attitudes to the animals and lack of knowledge about the animals amongst the participants in this study. Although the study design did not seek to quantitatively gauge knowledge on the subject, the open-ended responses in the interviews indicated a reasonable level of knowledge about brushtail possums on the part of most respondents, both possum lovers and possum haters. Therefore, further education on the subject, often advanced as a solution by other workers (for example Miller *et al.* 1999, Matthews *et al.* 2004) would not necessarily successfully address the issues of concern⁸.

Other studies (for example, Miller *et al.* 1999) have consistently found a lack of knowledge about possums (including among some professionals such as veterinarians). It is possible that in the present study, because some participants had already taken action to do something themselves about their 'possum guests/pests' then higher levels of knowledge were seen than have been reported in other studies. This is because either some learning is inevitable if encouraging wildlife is successful, or because some knowledge is required in order to identify the problem and take action to mitigate it. Secondly, the area of Sydney from which most participants were drawn (Northern Suburbs) is relatively affluent and it would be expected that there would be a link between socioeconomic indicators⁹ and generally higher levels of education.

With respect to attitudes towards native animals in general, it is worth comparing the information gained during this study with past enquiries in this area. Miller (2003) conducted survey work in Victoria which was designed to elicit responses that would yield indications of the respondents' underlying values with respect to animals. The results indicated that the Victorian subjects generally had a "...relatively strong emotional attachment to animals and an interest in learning about wildlife and nature," which seemed to be linked to high rates of pet ownership. Wildlife stakeholder groups of all persuasions, for example both bird watching club members and shooters' association members, all scored highly on the interest in wildlife measures; the shooters association unsurprisingly also showing higher dominionistic/consumption scores¹⁰. Noting that Parks Victoria employees also scored more highly on both interest

8 Indeed the very categorizations used in some studies; 'negative' or 'positive' attitudes, may betray a normative bias on the part of the researchers; an underlying assumption that a wish to not co-exist with certain animals (a 'negative' attitude) is not supported by actual problems with the animals, just attitude problems with the people: that people with 'negative' attitudes are ill-informed (or stupid) and their attitudes need to be adjusted via education.

9 Both income and education status (ABS 2008a, 2008b)

10 Dominionistic/consumption outlooks are held by individuals who have an interest in controlling wildlife and nature through consumptive activities. An example of a statement which would be supported by a person with this outlook is: "If populations of the common brushtail possum are plentiful enough, I see little reason why they should not be trapped for fur or meat." (Miller 2003).

and dominionistic/consumption than the general public, Miller (2003) flagged the potential for conflict between these wildlife managers, and groups or members of the public who had lower dominionistic/consumption scores: thus highlighting the underlying source of such disagreements, being a person's values. The present study also points to values as a determinant of attitudes towards animals, with different paradigmatic viewpoints in evidence.

It has been argued elsewhere (Temby 2007, Wilks 2007, 2008), that the way an animal will be treated is a product of a person's values; the concepts and understandings a person has of that animal, or its species. It is possible to divide animals into four different 'types.' Place and time dependent, an animal may be viewed variously as a pest, a pet, a resource or a wild animal. There are some consensual overlaps between groups, for example, toy lambs are cute but lamb cutlets are for eating; but for most animals, most of the time, their 'correct' placement is not contested. The way animals are treated, ranging from consensus about what an animal is 'for,' to how much concern is shown for its welfare during for example, agricultural production processes or pest animal control programmes, are the results of the intersection between complex notions. These differences can also be seen in research and teaching activities. While native animals involved in research and teaching activities in NSW are rarely subjected to procedures causing significant suffering, only 30% of feral animals will be subjected to procedures causing little suffering; the remaining 70% will experience severe impacts, either significant suffering before death, or will be subject to a destructive procedure (NSW DPI 2005, Wilks 2007). Importantly, placement within a group is not fixed for some animals; under some circumstances the placement of an animal is contested or can be manipulated, and where the animal is re-situated will dictate its subsequent treatment. It is the animal whose 'correct' categorisation is contested that will become the focus of debate¹¹, as in the current instance: are urban brushtail possums valued wild animals, or are they pets, or are they pests? A person's answer to these questions will indicate how they think the brushtail possums should be managed. This process of contest has been very prominent in some areas, as for example during discussions about control of Kangaroo populations in peri-urban environments (SBS 2008, IHT 2008). In other circumstances, if economic damage is being caused, agriculturalists argue that some native animals are 'pests' and implement control measures. For example, 940,000 kangaroo culling permits were allocated in NSW during 2007 (DECC 2007), part of an annually assessed management plan with its roots in damage (i.e. to the agriculturalists' interests) mitigation. Other examples of this process of contest (for instance the control of brumbies and feral dog/dingo hybrids in the Kosciuszko area) are not too hard to find.

A NSW-based study by Matthews *et al.* (2004) concluded that the prevailing wildlife management arrangements in NSW were appropriate from a welfare point of view but were unlikely to address the nuisance problem, noting that the existing policy of 'living with possums' was unpopular with some members of the public. The present study underlines that some people who feel themselves to be tormented by brushtail possums are prepared to knowingly treat the animals in a manner that will adversely impact upon the animal, including people who consciously moved to bushland suburbs to be 'close to nature.' There may therefore be grounds to question the adequacy of the prevailing arrangements from an animal welfare view as this study has uncovered several instances of extremely cruel practices. It is not known (and it would be difficult to obtain reliable figures) how widespread unlicensed possum relocation is but it is probably reasonable to assume that any householder prepared to purchase a trap has purchased it because they intend to use it¹². Interviewees were aware that translocated animals do not fare well but some were prepared to undertake removals anyway: clearly, some people will relocate possums no matter how well they are educated or how aware they are of prevailing legislative provisions. As previously mentioned, when welfare and management issues were discussed with this group of interviewees, a common response was to the effect that they would just take a little more care in future to avoid detection.

There may be little value to be gained from educating some people about brushtail possums because the data generated in this study underline the relationship between the respondents' underlying values, how they decide what treatment an animal 'deserves,' and the way they will proceed. Changing a person's underlying values is a notoriously difficult enterprise and some people will probably never be prepared to accept brushtail possums on their properties. The interviewees in this study were well versed in the ways of the possum; most of the conflicts which have arisen are a consequence of their underlying value systems. This is not to say that pursuing education is never useful but that education about the brushtail possum alone will not change some people's attitude towards brushtail possums. While some people may be influenced by education programs, there is no value to be gained from insisting that education about the prevailing management approach will solve all problems and that the prevailing approach is therefore adequate. Such a dogmatic viewpoint glosses over the potential animal welfare concerns associated with illegal relocations. In addition, this insistence denies the possibility that some people's problems with brushtail possums may be real: in a few cases relatively large numbers of brushtail possums have been encouraged by some householders who have offered virtually unlimited food to the brushtail possums in order to encourage them to visit their property. This has had inevitable impacts upon neighbouring properties and probably upon the animals as well.

11 Seen in this way, some activism in the area of animal welfare and rights becomes more transparent. Devices used by animal rights activists in their literature to carry their point tend to maximise the potential emotional response elicited by viewing the (apparent) suffering of an animal in a category more immediately recognizable as a 'pet' rather than a 'pest' or 'resource' species. For example, literature showing pictures of domestic cats or beagles with surgical appliances implanted into their brains elicit more support for the cause than pictures of laboratory rats undergoing similar procedures (Keith Mann, Animal Liberation Front, *pers. comm.* 2005)

12 Russell (2008 *in prep*) found that 19% of survey respondents answered 'yes' to the question "Have you ever had a possum removed from your property?" and that of this group, 51% admitted to removing the possums themselves

Conclusions

If successful wildlife management is to occur, then it is important that researchers accept that, in some cases, the perceived problems with human-wildlife interactions may in fact be more than a reflection of solely a lack of knowledge which can be corrected via an appropriate education campaign: this study confirms the relationship between people's attitudes to possums and their underlying value system. Education relating to brushtail possums will not easily change people's underlying values and attitudes.

One area which could prove tractable to education is the potential for adverse animal welfare outcomes due to the actions of some possum lovers. Given the respect for and attachment towards possums expressed by possum lovers, it is likely that information on e.g. 'healthy' and 'unhealthy' feeding, or the need for possums to disperse, could help prevent the recurrence of some of the types of problems discovered during this study.

While the prevailing animal management policy of 'living with possums' may be appropriate in many instances, some valid reasons for the unpopularity of brushtail possums and prevailing management provisions exist. For some people (for example those with neighbours who overfeed possums), brushtail possums can definitely be a nuisance if allowed to concentrate in numbers due to the provision of additional food sources. For those affected, there is no legal way to effectively mitigate this. In such circumstances, some people clearly feel they are driven to act unlawfully to deal with this nuisance, even with the knowledge that the animals they are trapping and

translocating will be very adversely impacted. Thus, the policy of 'living with possums' may indirectly contribute to adverse animal welfare outcomes. However, some people apparently do not see the brushtail possum as an animal which merits any consideration of its welfare whatsoever and were willing to treat brushtail possums in very cruel ways although there was no evidence that they treated all animals cruelly: in some instances at least these people were willing to lavish care, affection and money upon their pet animals.

Clearly, the ease of availability of traps has contributed to unlicensed removals and these instances are cause for concern from an animal welfare viewpoint. The challenge for wildlife managers becomes whether to accept the behaviour of some possum haters towards these animals as it may not impact on population numbers; or alternatively to consider tightening of existing laws. This could include the restriction of trap sales and/or stricter licensing procedures, as also suggested by Matthews *et al.* (2004), with some kind of report keeping (for example a central register) on how many animals are trapped, where and by whom.

The observed attitudes of the possum lovers hinge upon perceptions of cuteness as well as notions of rareness, specialness, and endangerment. Although in the areas of study the brushtail possum is manifestly not rare or endangered, it has to a certain extent become emblematic of other animals that are at least within the minds of some of the interviewees in this study.

References

- ABS (Australian Bureau of Statistics).** 2008a. 2006 Census MapStats : Sydney (Statistical Division, *High Income Households: Households with gross weekly income of 2500 dollars or more as a percentage of all households based on place of usual residence*, 2006 Sydney (Statistical Division) by Statistical Local Area. Available from: <http://www.abs.gov.au/websitedbs/D3310114.nsf/home/home>, Accessed April 2008
- ABS (Australian Bureau of Statistics).** 2008b. 2006 Census Community Profile Series : Sydney (Statistical Division). Available from: <http://www.abs.gov.au/websitedbs/D3310114.nsf/home/home> Accessed April 2008.
- Australian Broadcasting commission (ABC).** 2007. <http://www.abc.net.au/rural/news/content/2006/s1904205.htm>
- Canfield, P. J., Hartley, W. J. and Dubey, J. P.** 1990. Lesions of toxoplasmosis in Australian marsupials. *Journal of Comparative Pathology* 103: 159-167.
- Chilvers, B. L., Cowan, P., Waddington, D. C., Kelly, P. J. and Brown, T. J.** 1998. The prevalence of infection of *Giardia* spp. and *Cryptosporidium* spp. in wild animals on farmland, southeastern North Island, New Zealand. *International Journal of Environmental Health Research* 8: 59- 64.
- Cowan, P. and Clout, M.** 2000. Possums on the move: Activity patterns, home ranges, and dispersal. Pp. 24–34 in *The brushtail possum – biology, impact and management of an introduced marsupial* ed by T.L. Montague. Manaaki Whenua Press: Lincoln, Canterbury, New Zealand.
- Clinchy, M., Taylor, A. C., Zanette, L. Y., Krebs, C. J. and Jarman, P. J.** 2004. Body size, age and paternity in common brushtail possums (*Trichosurus vulpecula*). *Molecular Ecology* 13: 195-202.
- Davies, R. G., Webber, L. M. and Barnes, G. S.** 2004. Urban wildlife management – it's as much about people! Pp. 38-43 in *Urban wildlife: more than meets the eye*, edited by D. Lunney and S. Burgin. Royal Zoological Society of New South Wales: Mosman.
- DECC (New South Wales Government Department for Environment and Climate Change).** 2007. <http://www.environment.nsw.gov.au/wildlifemanagement/KMPZoneQuotas2007.htm> Accessed April 2008.
- DECC (New South Wales Government Department for Environment and Climate Change).** 2008. www.environment.nsw.gov.au/plantsanimals/RemovingAPossumFromYourRoof.htm Accessed April 2008.
- DEHSA (Department of the Environment and Heritage – South Australia).** 2008. <http://www.deh.sa.gov.au/biodiversity/possums.html#trapping> Accessed April 2008.
- deLacey, C. and Chamberlain, S.** 2007. Planting for possums: Prime Pickings or Prohibited Provender: A discussion paper from a horticultural and wildlife care perspective. Pp 99-116 in: *Pest or Guest: the zoology of overabundance*, edited by D. Lunney, P. Eby, P. Hutchings and S. Burgin. Royal Zoological Society of New South Wales, Mosman, NSW, Australia.
- DSE (Victorian Government Department of Sustainability and Environment).** 2008 <http://www.dpi.vic.gov.au/dse/nrenpa.nsf/FID/-896622525C7E9C114A2569AB002898B3?OpenDocument> Accessed April 2008.
- Eymann, J.** 2006. Management of urban common brushtail possums (*Trichosurus vulpecula*). PhD thesis, Department of Biological Sciences, Macquarie University, Sydney, NSW 2109.

- Eymann, J., Herbert, C. A. and Cooper, D. W. 2006a. Management issues of urban brushtail possums (*Trichosurus vulpecula*) – a loved or hated neighbour. *Australian Mammalogy* 28: 153-171.
- Eymann, J., Herbert, C. A., Cooper, D. W. and Dubey, J.P. 2006b. Serologic survey for *Toxoplasma gondii* and *Neospora caninum* in the common brushtail possum (*Trichosurus vulpecula*) from urban Sydney, Australia. *Journal of Parasitology* 92 (2): 267–272.
- Eymann J., Smythe L. D., Symonds, M. L., Dohnt, M. E., Barnett, L. J., Cooper, D. W. and Herbert, C. A. 2007. Leptospirosis Serology in the Common Brushtail Possum (*Trichosurus vulpecula*) from Urban Sydney, Australia. *Journal of Wildlife Diseases* 43(3): 492-497.
- Fayer, R., Dubey, J. P. and Lindsay, D. S. 2004. Zoonotic protozoa: from land to sea. *Trends in Parasitology* 20: 531-536.
- Gaby, S. 2003. The ethical pregnancy: reproductive choice in the context of prenatal testing. PhD Thesis, Macquarie University, Sydney NSW 2109
- Gibbs G. 2002. *Qualitative data analysis*. Open University Press, Birmingham.
- Glaser B. and Strauss A. 1967. *Discovery of grounded theory; strategies for qualitative research*. Sociology Press, New York.
- Goldingay, R. L. and Jackson, S. M. (eds.), 2004. *The biology of Australian possums and gliders*. Surrey Beatty and Sons Pty Limited, NSW, Australia, pp. 574.
- Hadfield, L. 2008. The Public Debate on Genetic Modification (GM) - Varieties of Understanding. Pp 143-158 in *Seeking Environmental Justice*, edited by S. L. Wilks, Rodopi, Amsterdam.
- Harper, M. J. 2005. Home range and den use of common brushtail possums (*Trichosurus vulpecula*) in urban forest remnants. *Wildlife Research* 32:681-687.
- Hemsley, S. and Canfield, P. J. 1994. Dermatitis in free-living common brushtail possums (*Trichosurus vulpecula*). *Australian Veterinary Practitioner* 3: 147-155.
- IHT (International Herald Tribune). 2008 <http://www.iht.com/articles/2008/03/13/asia/australia.php>
- Isaac, J. L. 2005. Life history and demographics of an island possum. *Australian Journal of Zoology* 53:195-203.
- Kerle, A. 2001. *Possums - the brushtails, ringtails and greater glider*. University of New South Wales Press Ltd: Sydney, Australia.
- Levett, P. N. 2001. Leptospirosis. *Clinical Microbiology Reviews* 14: 296-326.
- Mason, R. J., Fleming, P. J. S., Smythe, L. D., Dohnt, M. E., Norris, M. A. and Symonds, M. L. 1998. Leptospira interrogans antibodies in feral pigs from New South Wales. *Journal of Wildlife Diseases* 34: 738-743.
- Matthews, A., Lunney, D., Waples, K. and Hardy, J. 2004. Brushtail Possums: “Champions of the suburbs” or “Our tormentors”? Pp. 159-168 in *Urban Wildlife: more than meets the eye*, edited by D. Lunney and S. Burgin. Royal Zoological Society of New South Wales, Mosman NSW, Australia.
- Menkhorst, P. W. and Knight, F. 2004. *A field guide to the mammals of Australia*. Second edition. Oxford University Press, South Melbourne, Victoria.
- Miller K. Brown P. R. and Temby I. 1999. Attitudes towards possums: a need for education? *The Victorian Naturalist* 116: 120-127.
- Miller, K. K. 2003. Public and stakeholder values of wildlife in Victoria, Australia. *Wildlife Research* 30:465-476.
- Montague, T. L. 2000. *The Brushtail Possum – Biology, impact and management of an introduced marsupial*. Manaaki Whenua Press, Lincoln, New Zealand, 292 p.
- NSW DPI (New South Wales Department of Primary Industry). 2005. Animal research review panel NSW annual report. NSW Department of Primary Industries, 161 Kite St, Locked Bag 21, Orange, NSW 2800.
- Pietsch, R. S. 1994. The fate of common brushtail possums translocated to sclerophyll forest. Pp. 239-246 in *Reintroduction biology of Australian and New Zealand fauna*, edited by M. Serena. Surrey Beatty and Sons: Chipping Norton.
- Russell, T. 2008. Masters Thesis, in preparation. Department of Biological Sciences, Macquarie University, Sydney, NSW 2109.
- SBS (Special Broadcasting Service). 2008. International outcry over kangaroo cull http://news.sbs.com.au/worldnewsaustralia/international_outcry_over_kangaroo_cull_542598 Accessed April 2008.
- Statham and Statham H.L. 1997. Movements and habits of brushtail possums (*Trichosurus vulpecula* Kerr) in an urban area. *Wildlife Research* 24: 715-726.
- Sturdee, A. P., Chalmers, R.M. and Bull, S.A. 1999. Detection of *Cryptosporidium* oocysts in wild mammals of mainland Britain. *Veterinary Parasitology* 80: 273-280.
- Temby, I. 2007. Pest or guest – some perspectives of abundant wildlife in Victoria. Pp150-157 in *Pest or Guest: the zoology of overabundance*. Edited by D. Lunney, P. Eby, P. Hutchings, and S. Burgin, S. Royal Zoological Society of New South Wales, Mosman, NSW, Australia.
- Viggers, K. and Spratt, D. 1995. The parasites recorded from *Trichosurus* species (Marsupialia, Phalangeridae). *Wildlife Research* 22: 311-332.
- Wilks, S. L. 2007. *Rubbish, Bags and Koalas. Case studies in environmentalism*. PhD Thesis, Department of Biological Sciences, Macquarie University, Sydney, NSW 2109.
- Wilks, S. L. 2008. How many Koalas are there on Kangaroo Island? Pp 203-224 in *Seeking Environmental Justice*, edited by S. L. Wilks, Rodopi, Amsterdam.

APPENDIX I



Possum in trap.
Photo, J. Eymann



Possum in a nest box. Many householders offer nest boxes to possums both as an incentive to remain on their property and as an alternative home when they have 'evicted' an animal from their roof space.
Photo, J. Eymann



Possums can be enticed to accept food from humans.
Photo, J. Eymann

APPENDIX I



Possoms frequently take up residence in buildings where they may be unwelcome.

Photo, J. Eymann



Young possums.

Photo, J. Eymann