Post-Traumatic Stress Disorder in Kangaroos*

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1. Putting a name to a challenging situation for carers

Every now and then experienced macropod carers will notice that a new arrival in their care will be inconsolable and very difficult to look after. These animals demonstrate a complete disregard for their own safety in their actions, are erratic, will roar and be aggressive, 'sulk', not take a bottle of formula, not stay in a bag, will throw themselves around their immediate environment, not engage with their carer or others of their kin, and will not even settle with sedation. In some cases a macropod demonstrating these behavioural characteristics will die from myopathy, leaving the carer completely at a loss as to what they could have done differently to help the animal.

Knowing the full history of why such an animal came into care is particularly important as it is possible the animal is suffering from an acute stress disorder resulting from exposure to a life-threatening event. When symptoms persist for longer than one month the disorder is classified as post-traumatic stress disorder (PTSD) rather than an acute stress disorder (Treatment Protocol Project 2004: 250-252). Such animals may need to be cared for differently from other in-care macropods if they are to survive.

We all know that kangaroos are prone to stress and experienced carers take a range of ameliorative measures to reduce stress. However, when the result of trauma becomes a disorder in a behavioural and neural sense other strategies may be needed. Such a disorder results in an inability of the animal to establish functional relationships with its environment, its kin or its carer. Mob social skills are an important survival requirement for kangaroos.

While we often hear about post-traumatic stress disorder (PTSD) in returned military personnel and emergency workers we rarely consider that such a disorder might apply to non-human mammals. However, recent thinking in behavioural neuroscience suggests a neural basis of emotion and consciousness common to all mammals – not only humans (Panksepp 1998,

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2004; Cambridge Declaration on Consciousness 2010), as well as some other species.

PTSD is defined in the literature as an amalgam of psychophysiological, behavioural, and neural markers associated with the way fear has been processed. There has now been considerable research into PTSD in humans in all three of these areas (Shvil *et al* 2013). Nevertheless, the evidence is still not clear from laboratory studies as to whether a defined set of PTSD markers can cope with individual differences in the way PTSD presents and, as a result, any possible treatment.

Against this background any examination of PTSD in wild animals offers even more challenges. Laboratory studies are likely to be unsuccessful due to anthropocentric and anthropomorphic structure of the testing regime and there are questions of communication with the wild animal. Clearly, any study of wildlife affective emotion has to be observed in context i.e. in the wild or in-care rather than in the laboratory.

The next section summarises some of the literature on PTSD in humans and animals as it relates to markers and treatment. It also reviews our work on affective emotional behaviour markers in kangaroos as a basis for the analysis of PTSD in this animal. Section three discusses a number of in-care case studies of acute stress disorder and PTSD in kangaroos and reflects on markers, treatment and outcomes.

Section four moves from the in-care situation to the wild and examines the behavioural characteristics of kangaroos in three different circumstances: a safe ‘opportunity seeking’ environment, an environment featuring intrusion by humans and domestic animals where there is moderate fear generation; and an environment featuring major fear generation from regular harassment by humans and dogs, shooting, poor supply of food and water, and roadway intrusion into and containment of habitat. Section five draws on the earlier findings and presents strategies for carers regarding assessment and treatment of acute stress disorder and PTSD in the in-care situation. Section six draws on our findings of PTSD in kangaroos in the wild and suggests ways of ameliorating this problem. Section seven presents some conclusions from the research.

2. Literature themes

2.1 PTSD in humans

A particular characteristic of PTSD is how individuals respond emotionally to fear generating situations such as a life-threatening event. It represents dysfunctional processing of fear-inducing circumstances by the brain. It manifests as an amalgam of three sets of symptoms, viz: a re-experiencing of an

earlier trauma; an intentional avoidance of any reminders of an earlier trauma; and emotional numbing and hyper-arousal. About half of all adults report experiencing a PTSD candidate event but only five per cent of males and 11 per cent of females actually develop PTSD as a result (Treatment Protocol Project 2004:252). Individual personality has a role to play as to the degree of long term impact of an acute stressful event. Our observations in kangaroos suggest that personality also plays a role in the development of PTSD in these animals.

Shvil *et al* (2013: 2) state:

> *The symptom constellation of emotional numbing and hyper-arousal, hyper-vigilance, as well as intrusive memory phenomena such as in the forms of nightmares and flashbacks are particularly characteristic of post-traumatic stress disorder (PTSD)*.

Markers of PTSD dysregulation of emotional processing in the face of fear have been identified for humans in three areas: (a) *psychophysiological*, where elevated responses (startle reflex) to fear-associated stimuli are indicated in laboratory studies in the form of heart rate, skin conductance and facial reaction markers; (b) *neural activation*, shown via MRI and other neuroimaging in response to negative and trauma-related stimuli; and (c) *behavioural* markers in the form of attention bias abnormalities.

2.2 PTSD in animals

While human studies of PTSD are undertaken in controlled laboratory conditions and provide a guide to what might occur for non-human mammals (Panksepp 1998, 2004) the anthropocentric nature of these laboratory studies, data availability, as well as the difficulty of communicating with the non-human animal, make such approaches impossible. Nevertheless, as highlighted in other studies (e.g. Bradshaw *et al* 2009; Garlick and Austen 2012a, 2012b and 2014; Garlick 2014) we can reveal emotion markers through a relational ethic of care of the ‘being-for’ (Bauman 1995) kind. We have argued elsewhere that emotions (affection, joy, sadness, anger, anxiety, aggression, fear etc.) suggest a form of language and communication (Panksepp 1998, 2004) and can potentially provide intelligence to us on the wellbeing of a wild animal in its environment and habitat (Garlick and Austen 2012a, 2012b and 2014; Garlick 2014).

There have been many ethological studies of animal cognition (see Beckoff *et al* 2002). In 2007, Beckoff first raised the possibility that animals have emotional lives and could be subject to psychological disturbance. However Bradshaw notes it is critical to break away from ethological /animal behaviour model of animals to a neuropsychological one.

Studies of elephants (Bradshaw, 2012), parrots (Bradshaw *et al* 2009) and great apes (Bradshaw *et al* 2011), using various testing regimes against the *Diagnostic and Statistical Manual of Mental Disorders* of the American Psychiatric Association (DSM-IV-TR), suggest that PTSD is real in captive wild animals and has a neuropsychological underpinning. The video (https://www.youtube.com/watch?v=1JB1XCbBJQs&feature=youtu.be) by Bradshaw on PTSD in wild elephants in Africa is particularly instructive and suggests, along with other recent literature, that PTSD in humans and animals is synonymous. It also suggests a connection between psychological extinction and the more generally known physical extinction. The evidence however is quite nascent and limited in species coverage. When it comes to possible treatment of PTSD in animals in the wild the evidence is even more scant. Only Bradshaw *et al* 2009 (parrots) attempt to consider actual treatment.

Research into PSTD in wild animals must now focus on three areas: testing across a wider range of species and fear-induced circumstances; greater examination of successful treatment options (relational and medicinal); and examination of PTSD in animals in their wild state. This paper attempts to stimulate research in these three areas.

Our research into affective emotion markers in kangaroos has identified a number of neural emotional states in the in-care and wild environments (Garlick and Austen 2012a, 2012b and 2014, Garlick 2014). We believe this research provides a basis for examining PTSD in kangaroos; known for their stress levels, strong social connections and vulnerability to many traumatic circumstances caused by humans. This research could provide a basis for suggesting possible treatment for PTSD in kangaroos brought into care and how kangaroo well-being can be ethically addressed in the wild.

Given findings on PTSD in kangaroos in care and in the wild, the question arises how can we get those trapped in a negative fear/ escaping emotional state to move into a more positive opportunity/seeking emotional state? The findings suggest strategies to ensure physical environments are reinforcing (opportunity/seeking) and not restricting (fear/escaping) for wild kangaroos. This latter point is significant because of kangaroos' vital connections with environmental sustainability (Garlick and Austen 2012a, 2012b and 2014, Garlick 2014).

The path-breaking PTSD assessment work of Bradshaw on elephants, parrots and chimpanzees to date is significant in highlighting psychological disorders in wild animals and in pointing the way towards exploring treatment requirements and supportive physical environments for a wide range of wild animals.

In their work on young captive parrots, Bradshaw *et al* (2009) examined relational trauma in these birds when they lose a parent. Bradshaw states it is important to gather as much information as possible regarding the background to the

initial trauma. This is something we have sought to do in our current work with kangaroos and, as Bradshaw says, to '…create social and ecological habitats that support psychological recovery and wellbeing.' Bradshaw emphasises the need for animals with a high attachment requirement to feel they have a '…secure sense of self and competence within their environmental sphere.' Kangaroos have strong social bonds within their mob and therefore attachment is a significant part of their psychological make-up.

Coming to PTSD treatment, Bradshaw (2009) concludes that in most cases a combination of psychotropic medication, as a short-term measure, and relational attachment with kin or carer appears to be most effective. On the latter requirement Bradshaw states the need for a '…relational holding environment to permit 'the client' to feel safe enough to allow his/ her true self to emerge without an excessive fear of vulnerability and exposure.'

2.3 Affective emotional markers in kangaroos

Advances in affective neuroscience of mammals (Panksepp 1998, 2004), together with a 'being-for' relational ethic of care (Bauman 1995, Derrida 2008, Noddings 1984), enable insights into the emotional lives of kangaroos (Garlick and Austen 2012a, 2012b and 2014, Garlick 2014).

In our research, a range of kangaroo behavioural markers that reflect six neural emotional states (joy, separation, anger, relaxation, nurturance, and sexuality) are used in both the in-care and wild contexts. From these, reinforcing and restricting environments for wildlife are identified with respect to two key emotional states for mammals identified by Panksepp (1998 and 2004). These two states are seeking to engage with opportunity in the wider world in terms of realising their capability (Nussbaum 2003 and 2011), and fear/ escaping from a limiting environment to places where capability can be more fully exercised. The classification of a wildlife environment as reinforcing or restricting is a clear indication of its emotional health impact on macropods and other wild animals (refer Table 1). We might expect PTSD to be a feature of the fear/ escaping physical environment.

3. In-care behaviour observations: Six cases of acute stress disorder and PTSD

At our wildlife recovery centre we have around 200 severely injured, sick and traumatised macropods (mostly kangaroos and wallabies) and wombats coming into care each year. These animals range in size from the tiny (several hundred grams) to the large (70 kg). Some are orphans, some come in as pouched young with their injured mothers, some are geriatric, and many have a variety of injuries that include limb, pelvic and skull fractures, severe wounds, facial injuries and/or serious illnesses such as pneumonia and myopathy.

Table 1. Connecting wildlife emotion to environmental health: The kangaroo

Neural emotional state	Outward indicators	Environmental context
Joy (play)	Hooning (rapid movement), kicking legs into the air, boxing with kin, chasing kin, eye expression.	Reinforcing
Separation, distress (panic)	Vocal, running into objects in panic, eye expression, erect and extended posture, licking forearms, rapid respiratory rate, body tintibulation (shivering effect).	Restricting
Nurturance (care)	Preening, embracing kin, body contact, protective behaviour by dominant males	Reinforcing
Sexuality (lust)	Courtship behaviour, pairing, long-term male/female friendships	Reinforcing
Anger (rage)	Vocalisation (growl), eye expression, posture	Restricting
Relaxation	Lying on back asleep, mothers relaxing pouch muscle, mothers allowing small infants to exercise outside pouch	Reinforcing

Source: after Garlick and Austen 2012a, 2012b and 2014.

Each year around 100 fully recovered animals are translocated and released into their natural environment in social groups of ten or more (Garlick and Austen 2010).

In the following, several in-care cases are outlined that have been assessed as having acute stress disorder and subsequent PTSD against the DSM-IV-TR criteria. Their treatment and outcomes are also described.

Case 1: Iggy (figs 1 & 2)

Background:

Iggy was a 3.5kg female kangaroo joey forced to leave her mother's pouch too early due to her mother's illness (possible myopathy as a result of a dog chase). The mother was euthanased on public land by a government ranger who irresponsibly left the small joey to fend for herself until after three days she was able to be independently darted and brought into care. During the three days the infant was alone she was harassed by dogs and foxes and had no access to her mother's milk. When not being harassed she stood beside her dead mother.

In-care behaviour:

When taken into care (25 February 2013) Iggy was highly stressed, erratic, did not want to stay in her bag, adopted self-harming actions such as running into fences and would suddenly leap into the air without provocation. This is not normal behaviour. Ordinarily, a joey of this age coming from its mother's pouch would readily be comforted by being placed in a bag and offered formula.

Treatment:

Initial treatment involved low-level sedation with injectable Diazepam (Pamlin 0.05ml/ kg SCI) twice daily to lessen her agitated state. We do not normally use medication such as Modecate (Fluphenazine) on small joeys, but, in hindsight, it might have been useful in this case. Initially, Iggy was placed in a quiet indoor environment with several other joeys of similar ages. There was little human contact but she still did not settle and was easily frightened by extraneous noise. Human contact was not forced upon her.

Outcome:

As Iggy was uninjured she was moved to an external safe enclosed environment to bond with others of similar ages. However, over the ensuing month she remained distressed and easily agitated by surrounding movement and general noises in the environment (e.g. birds squawking). She did not bond with other joeys or find comfort in being near the older kangaroos that were used to being in-care. She died (26 March) from myopathy following a noise disturbance to which she responded with significantly more anxiety than other in-care animals in the enclosure. Despite being caught immediately and given sedation she did not settle. Her eyes were wide open and she appeared to be in a trance. Despite the medication and being held in a bag her muscles began to fasciculate within 30 minutes and within two hours she had died.

Case 2: Bernie (figs 3, 4 & 5)

Background:

Bernie was a 4.0kg kangaroo joey who was darted (3 June, 2013) next to his sick mother. The mother was also darted, so Bernie had his mother with him in care for two days before she died. He was forced out of his mother's pouch early because of her illness and was severely malnourished.

Behaviour:

Bernie did not interact with others in care and remained aloof from other animals and his carer. While his behaviour was not as erratic as Iggy's, he was also unsettled, did not want to stay in a bag, and would not take a bottle of formula. He would stand alone in the enclosure looking miserable with a blank facial expression. The main difference between Iggy and Bernie is that Bernie came into care with his mother. It is important not to underestimate the comfort a joey has in having their mother with them. A second difference was the different environments from which the two animals had come. Iggy came from a more stressful environment where harassment by dogs and humans was a regular occurrence.

Treatment:

Bernie was given Diazepam initially (0.05ml (0.25mg)/kg SCI) twice daily to reduce his anxiety and Fluphenazine decanoate (Modecate 0.5mg/ kg IMI). Carer interaction on a close personal level was much greater than for Iggy and this interaction with his carer, together with the medication, appears to have had a significant benefit for Bernie. Every evening Bernie was caught by his carer, put in a bag, given a bottle of formula, cuddled and put in a safe place where he could observe the antics of the other in-care joeys. This strong attachment of Bernie with the carer continued over a long period until he felt safe and confident enough to interact with his kin and his environment.

Outcome:

Ten months later, Bernie is 20 kg and continues to thrive. He interacts with other kangaroos in care and is now ready for release. He retains his strong attachment to his carer.

Case 3: Crackles (fig 6)

Background:

Crackles was a 5kg kangaroo joey who was found alone in a paddock being attacked by a fox (28 October, 2013). He suffered fractured ribs, severe abdominal bruising and extensive puncture wounds to head, neck and back. From his injuries Crackles developed subcutaneous emphysema, a potentially fatal situation where air increasingly occupies space under the skin. Crackles was examined by the veterinarian who believed his prognosis was poor.

Behaviour:

Crackles was agitated, would not go into a bag or take formula, exhibited destructive behaviour and was aggressive towards other animals, particularly toward another PTSD in-care kangaroo joey named Dr Who.

Treatment:

Crackles was kept in a very quiet environment and given antibiotics and analgesia. He was given Diazepam initially (0.05 ml (0.25mg) / kg SCI) twice daily and Fluphenazine (Modecate) at a higher dose (2mg/ kg IMI). He was quiet enough to facilitate recovery from his injuries, settle into his environment and later develop a close relationship with Dr Who, a joey that came into care about one month after Crackles. Both these animals were kept in a quiet environment inside by themselves for an extended period and a strong bond gradually formed between them.

Outcome:

Crackles eventually settled in well with all the other in-care animals, coped well with the outside environment and is now 13.5kg. He continues to have a strong friendship with Dr Who.

Case 4: Dr Who (fig 6)

Background:

Dr Who was a 5kg at-heel joey who was rescued (23 November, 2013) in suburbia in a private residence in a highly stressed state without his mother. We do not know what became of his mother. He was not injured.

Behaviour:

In care he was highly agitated and difficult to settle and would destructively throw himself around his environment. On one occasion he jumped on to a bench, knocked items into a sink that blocked the plug hole and then pushed the tap on thereby flooding the building. He would not initially go into a bag until he was presented with a particularly soft and deep bag in which he would hide for long periods.

Treatment:

Dr Who was given Diazepam (0.05ml (0.25mg)/ kg SCI) twice daily and Fluphenazine (Modecate) at 1.0mg/ kg IMI. Dr Who was initially kept in a quiet inside environment with Crackles, received considerable attention from his carer, loved a bag and developed a strong attachment with Crackles.

Outcome:

Dr Who is now 12kg, has Crackles as his friend, interacts normally with the other kangaroos and copes well in an outside environment.

Case 5: Tammy (fig 7)

Background:

Tammy had been lying near a farm dam for three days without her mother before being brought into care (31 December, 2013). She was 5kg and had pelvic fractures and a deep laceration to her ankle involving an ankle ligament. She was unable to stand and was very dehydrated.

Behaviour:

In care Tammy was very quiet and withdrawn and because she was immobile she was easier to care for. Tammy was initially difficult to feed with a bottle of formula. Because of her pelvic injuries she spent her time on a comfortable mat. We

have found in our work with fence injured macropods (Austen and Garlick 2012), which are usually not mobile for weeks to months, that they learn to trust their carer quickly. In contrast Tammy remained aloof for a long period. She did not interact with Dr Who and Crackles who were in the same room as her for the first month of her care. She however developed a strong attachment to Danny who was rescued six weeks after her.

Treatment:

She was rehydrated, had a ligament and laceration repair, analgesia and antibiotics. Because of her pelvic injuries she spent much of her time resting on a comfortable mat and was turned twice daily. There was a constant human presence and she slowly developed a trusting relationship with her carer.

Outcome:

Tammy has done very well and is now 8.5 kg. She has Danny as a constant companion. She is now very affectionate, enjoys a formula bottle and adjusted well to the outside environment.

Case 6: Danny (fig 7)

Background:

Danny was a 5kg joey rescued from inside his dead mother's pouch (10 February, 2014). He had been fending off an attack from a fox when rescued. The fox had begun to tear at the mother's pouch to get to the joey. Danny was highly stressed and agitated when brought to our recovery centre by a rescuer. He had no injuries but the rescuer had considerable difficulty in getting Danny out of his dead mother's pouch.

Behaviour:

Danny was very frightened when brought into care and would not settle initially. He would not stay in a bag even though he was rescued from his dead mother's pouch.

Treatment

Danny quickly bonded to Tammy, an important factor in his recovery. He was placed in a bag twice daily and given a bottle of formula.

Outcome

Danny is doing very well and is now 9kg. He will approach his carer for a bottle of formula, enjoys a cuddle and will stay in a bag next to Tammy who sleeps on a mat. Danny's anxiety symptoms settled within one month after coming into care.

He would be classified as having acute stress disorder rather than PTSD. Tammy is his constant companion.

In summary, as we have found in fence injured macropods who have also suffered a candidate event for PTSD the following aspects of initial care are important: (1) judicious use of Diazepam and Fluphenazine; (2) housing in an inside environment; and (3) development of a strong bond with kin and carer.

4. Behavioural observations in the wild – three case areas

In the previous section in-care cases were described against PTSD criteria using the DSM-IV-TR and the emotional behaviour markers in Table 1. In this section three geographic areas of observed kangaroo behaviour in the wild are reported against PTSD criteria and their surrounding environment. The three areas are: (a) Reinforcing environment (Site 1). This is a large safe wildlife sanctuary release site for rehabilitated animals from our recovery facility; (b) A moderately restrictive environment (Site 2). These are sites within the nature reserve system of the Australian Capital Territory (ACT) where there is moderate harassment from humans and dogs, the vegetation cover provides reasonable habitat and where there is some containment due to surrounding urban road systems; and (c) Extremely restricting environment (Site 3). These are sites within the nature reserve system of the ACT where there is extensive harassment from dogs, recreational human activity and surrounding leasehold farmers; where there has been an annual killing shooting program implemented by the ACT Government; where there is containment by fencing and surrounding busy urban roadways; where the vegetation cover is poor due to extensive weeds and minimal tree cover; and water supply is limited.

To gather data from Sites 2 and 3, 11 nature reserves were visited. Equipment included GPS, distance viewer, binoculars and compass. Site 2 included Farrer Ridge, Mount Majura, and O'Connor Ridge. Site 3 included Wanniassa Hills, Callum Brae, Crace, Goorooyaroo, Kama, Mt Painter, Mulligans Flat, and The Pinnacle. Descriptions of these various reserves are available at http://www.tams.act.gov.au/parks-recreation/parks_and_reserves/canberra_nature_park

Line transects were constructed on topographic maps for each reserve to enable accurate kangaroo population counts to be undertaken, population characteristics noted and behaviour observed. The numbers of adults and at-heel joey offspring were estimated and behavioural responses to human presence (degree of vigilance and panic) and the other emotional behaviour markers (play, nurturance, relaxation and anger) in Table 1 were noted.

SITE 1: Reinforcing environment

While ordinarily kangaroos view humans as a predator to be avoided, in situations in the wild where they were reunited with their original carer it was possible to be at touching distance. The proportion of at-heel offspring in the observed population was around 40 per cent. Released kangaroos would only approach when called in by their carer. They were not habituated. Behaviour markers observed were consistent with a reinforcing environment (ie. play, nurturance, relaxation)

SITE 2: Moderate restricting environment

At these reserves we found at-heel offspring was at around 35 per cent of the total population. While there was some heightened vigilance to human presence it was not overly so and there appeared to be a mutual coexistence with humans within certain limits. It was possible to come within 25 metres of the kangaroos at these reserves. Nurturance and play were observed.

SITE 3: Extreme restricting environment

At these reserves kangaroos were hyper-vigilant (panic) at the sight of a human – even to a distance of several hundred metres. Infant offspring (at-heel joeys) were a much lower proportion of the population, at around 20 per cent, suggesting that the highly stressful environment impacted negatively on reproduction. There was no evidence of play or relaxation. There was no escape from the fear-inducing environment for the animals via wildlife corridors.

5. Strategies for kangaroo carers

The numbers of kangaroos being rescued exhibiting acute stress disorder and subsequent PTSD coming into care is likely to be an increasing phenomenon wildlife carers will have to deal with as human expansion intrudes more and more on kangaroo habitat and human disrespect for wildlife persists. Coming into care many of these animals are likely to be highly vigilant and anxious, self-harming and erratic in their behaviour and some may also be withdrawn and non-interactive with kin and carer. Without appropriate intervention from carers it is possible that many of these animals will die from stress-related problems such as myopathy, coccidiosis and parasite infestation. Our experience with PTSD kangaroos supports the medication conclusion of Bradshaw. Modecate can be used in some animals as a short-term aid facilitating relationships either with the carer or with kin in the in-care sanctuary environment. Modecate has been used in zoos for many years for stress reduction in zoo animals. It is also likely that this relationality may need to be managed by carers for a reasonably long period before the animal develops full confidence in its environment.

6. Strategies for managing PTSD in kangaroos in the wild environment

Increasingly, kangaroos occupying public spaces are under threat from human harassment, harassment from dogs, institutional killing programs and habitat degradation and destruction through the proliferation of weeds and human infrastructure such as walk and bikeways. Under these circumstances our observations suggest that PTSD occurs in resident animals indicated by reduced procreation, hyper-vigilance (including panic), and a lack of play and nurturance. Strategic intervention is required to assist kangaroos to move from these fear-inducing environments. Wildlife corridors and translocation have been demonstrated to be highly successful means of introducing wildlife, including kangaroos (Garlick and Austen 2010) to more amenable (opportunity-seeking) environments. In the nature reserves of the ACT examined in this research there are no wildlife corridors of any substance.

In situations where an opportunity-seeking environment for the kangaroo becomes a fearful environment through human action, such as in the reserves indicated in Site 3 in the Australian Capital Territory, it is unethical to not allow safe movement of the animals to more conducive environments. This makes so-called 'wildlife management' practices of killing ('culling') and sterilisation, where there is no change to the fear elements of the environment itself, not only complicit in causing PTSD but potentially illegal under animal cruelty legislation. It is therefore unethical institutional (and potentially illegal) behaviour in the management of public lands that impact negatively on the well-being of the wildlife that attempts to reside on them.

Bradshaw has suggested the notion of psychological extinction occurring in wild animals where the normal behaviour of the wild animal is altered by the negative context in which they reside. She has also suggested a connection between psychological extinction and the physical extinction of wildlife we are more familiar with. We note that the kangaroos, as highly stressful creatures, residing on site 3 reserves described exhibit behaviour via PTSD that is akin to psychological extinction.

7. Conclusions

Our research on kangaroos supports the conclusions of Bradshaw about elephants, parrots and chimpanzees in relation to the presence of PTSD in in-care animals. Kangaroos, faced with a life-threatening situation where they are without the care and support of their mothers, are likely to be suffering acute stress disorder when brought into care. Such a disorder has a negative impact on the capability of the kangaroo to form functional relationships with their kin or their carer and if their symptoms continue a PTSD diagnosis is made. Kangaroos in the wild subjected to constant harassment, shooting and poor habitat can suffer PTSD. When they cannot

escape from a restricting environment of fear to one of opportunity realisation it raises questions of inherent institutional cruelty in public land management practice that may have legal ramifications.

For the in-care kangaroo with acute stress we have found strong one-on-one carer input, having a kangaroo soul-mate and the judicious use of medication such as Diazepam and Fluphenazine, will aid the recovery. For the wild kangaroo, strategies such as wildlife corridors and translocation are increasingly needed to enable the kangaroo to move from a restricting fear-inducing environment to a reinforcing capability realising environment. We suspect the presence of psychological extinction in the kangaroos in these fear-inducing restrictive environments.

In this paper we have relied on diagnostic criteria for humans in assessing PTSD. We have used as a reference the DSM-IV-TR and the WHO International Classification of Diseases (ICD) criteria as it relates to PTSD. However such criteria are anthropocentric and anthropomorphic in their intent and language. We would argue that for wild animals in particular there is a need for separate PTSD criteria that are wildlife specific in design and implementation. Elsewhere (Garlick and Austen 2014, Garlick 2014) we have suggested a greater reliance on wildlife knowledge systems, predicated on an epistemology that also recognises emotional lives of animals and cognitive justice rather than human exceptionalism, to better inform human decision making regarding wildlife.

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Figure 1: Iggy - dart capture

Figure 2: Iggy in-care, week three

Figure 3: Darting Bernie's mother 3 June 2013

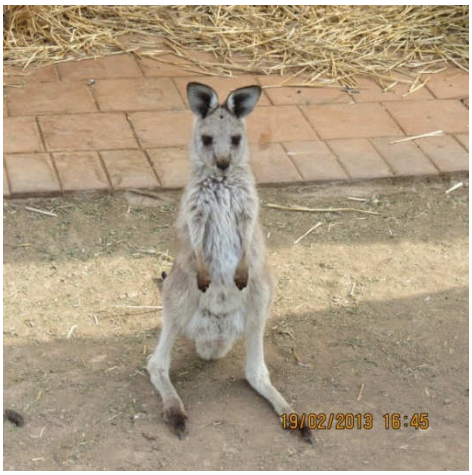

Figure 4: Bernie at rescue with carer (Benice)

Figure 5: Bernie 10 months after rescue

Figure 6: Crackles and Dr Who

Figure 7: Tammy and Danny