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No place to go? Management of non-human animal overflows in Australia

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ABSTRACT

I discuss overflows of several introduced vertebrate species in Australia and critically explore their construction as national pests – overflows - appropriate for management by lethal control. I outline the thanato-politics and thanato-economics of managing selected non-human animals by toxic baiting and/or viral infection in ecologies of toxicity and the trophic cascades which may ensue. Drawing on Foucault and Deleuze, I explore creative potentialities for conservation managers of thinking in terms of milieu and *environnementalité*; exploration of the conditions of possibility for non-human animals to live in their milieus, considering relationalities with elements such as habitat fragmentation, fire regimes, pesticide use and so on. This could form a biopolitics which relocates biopower to within the subject rather than a thanato-politics of overflow, surplus and death.

> "Nature is contingent, excessive and mystical"
> (Benjamin Blood, 1874; cited in Deleuze, 1994, p.57)

1. Introduction

Faunal and floral ecosystems in Australia have developed from speciation over c38 million years (Marks, 2004). However, since European colonisation some 230 years ago, over 70 introduced vertebrate species have become established in the wild and are now generally regarded as feral, invasive and overabundant. These species are considered surplus to ecologies of pre-colonial "natives" which have suffered the highest extinction rates of any mammalian fauna in the world (Fleming & Bateman, 2016). Several species, including wild dogs, feral cats, pigs, red or European foxes and European rabbits, have been declared Australian national pests, part of "the ecological axis of evil" (AWC, 2012). The prevailing management approach is lethal control; extermination by methods including toxic baiting or viral infection (rabbits). Such attempts at species specific technofixes render killing the easiest option for managing "surplus" or unwanted non-human animals. Its anthropocentrism denies species the expression of their own movements, desires and interactions in their milieu.

Reflecting on the concentration camps of World War II, Agamben (1998) makes the distinction between *bios*, as legally (and politically) existing being, and *zoë*, or "bare life", as a form of existence reduced to biological function and ethically killable without punishment. Going beyond Agamben's juridical perspective, I engage the ideas of Foucault and Deleuze. Foucault explores the interactions between, rather than the dualism of, *bios* and *zoë* (Lemke, 2011, 2016), while Deleuze (2001) seeks to go beyond a life either governed by confrontation with death or where immanence is mired in transcendence. Both recognise the creative potential of life beyond the biopolitical terrain of *bios* and *zoë*, of bare life and violence (Mills, 2013, p.78).

Ecological assemblages reference complex encounters and connective interactions amongst heterogeneous physical, social, economic and political materialities and expressivities. I regard *zoë* as a product of an assemblage in which humans, non-human animals, texts, poison, viruses and so on combine in ecologies of toxicity; where toxic materialities mediate human/non-human encounters and influence deathly outcomes through connections, disruptions and flows.

Deleuze and Guattari (1987) focus on processes rather than products; how something takes place and what it can do rather than what it is. Processes, such as the unfolding of life and death, are both material and expressive. Current Australian state

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management of vertebrate species, based in conservation biology, performs processes of legitimisation of static non-human subjectivities such as native, feral and pest, which structure management strategies accordingly. As I demonstrate below, non-human animals' responses to such management programs convey what Despret terms an "excess of achievements" (2016, p.73). Overflows of rats, for instance, have become consequent to the extermination of cats on Australian islands (Slezak, 2016).

I ask who decides (and how) both whether there are overflows of certain introduced species in Australia and also the logic of managing such species. "Whose lives count as lives?" (Wolfe, 2013, p.18). I aim to go beyond thanato-politics to emphasise a more complex bio-politics, and to go beyond thanato-economics to situate the economics of non-human animal death in Australia in its broader context. I regard conservation biology as a Deleuzian major or State science and call for its engagement with minor or nomad science which emphasises process rather than structure; heterogeneity, creative possibility and becoming rather than axiomatic positivism.

I explore Foucault's neglected concept of milieu/*environnementalité*. I retain the original French terms in order to differentiate their meanings from those in popular use, where milieu refers to environment as "surroundings" and the English "environmentality" often indicates application of Foucauldian governmentality to analysis of environmental regulation as a disciplinary form of governmentality, also known as "green governmentality" or "ecogovernmentality" (see Agrawal, 2005; Barnhart, 2014; Luke, 1999; Rutherford, 1999). Explained in detail below, milieu/*environnementalité* recognises interdependent entanglements of the human and non-human in regimes of ecological assemblages, exemplified by trophic cascades. Beings, such as humans, dogs, cats, foxes, rabbits, constitute themselves through the differential between exterior flows or milieus connecting them to other beings and assemblages and flows or milieus interior to their self. I illustrate the importance to conservation managers of using State science to reduce the dynamic, complex relationalities of both exterior and interior milieus of non-human animals so that extermination is rendered acceptable.

A milieu is a nexus of knowledge formation and power tactics. It includes economic, social, political, as well as environmental elements and capacities to affect and be affected. *Environnementalité* concerns action brought to bear on the milieu as a whole rather than on individual entities. A milieu is thus all of; a spatial environment, a medium of action and a force of movement in-between, (re)productive of a specific ordering of space, time and relations. A milieu approach recognises the full play of forces and their co-constitutive, complex relationalities. With regard to ecological assemblages, such an approach represents exploring the conditions of possibility for non-human animals to live in their milieu and to consider, in particular, relationalities with elements such as fragmentation of ground cover, fire regimes, availability of predators and prey and so on. It would redefine the capacities of animals from the point of their perceptions and *milieux de vie*, their capacities to affect and be affected in ecosystem assemblages rather than a scientifically-organised thanato-politics of overflow, surplus and death.

In what follows, I discuss perceived overflows of certain vertebrate species in Australia and critically explore why and how they have become constructed as national pests; *zoë* rather than *bios*. In the section on ecologies of toxicity I outline the thanato-politics and thanato-economics of death by toxic baiting and/or viral infection. In so doing I seek to give non-human animals some form of voice, albeit constructed by myself. I then explore potentialities of thinking in terms of milieu and *environnementalité* as "a spatial material distribution and relationality of power through environments, technologies and ways of life" (Gabrys, 2014, p.32) rather than the production of environmental subjects to be governed. *Environnementalité*-oriented forms of minor ecological science would not target "overflows" or surplus non-human animals for particular "management", but would rather practise with milieus, facilitating copoietic[1] life (Deleuze & Guattari, 1987; Plateau 1730).

2. Overflows of ferals: topographies of pest species

The concept of overflow suggests situations of "too much", overabundance and excess (Löfgren & Czarniawska, 2013). Tyner, citing Marx' (1990) notion of surplus population, asks "how certain groups … are considered expendable, … disposable, wasted or precarious" (2013, p.703). The binary opposite of overflow may be termed "underflow" (Löfgren & Czarniawska, 2013, p.3), insufficiency or lack. Both binaries theoretically presuppose a transcendent "ideal" amount: Aristotle's (2015) "golden mean", or "middle state between". Calculating an ideal amount, however, is impossible as it depends on how situations are framed, how elements are counted and is unable to account for dynamism or emergence. Moreover, as Löfgren & Czarniawska (2013) demonstrate, overflows may be regarded as either problematic or advantageous (such as a flood of water, an abundance of wealth). Löfgren (2012, p.101) suggests that the practices of coping with perceived overflows are particularly revealing of how societies work.

As the opening quotation illustrates, Deleuze regards nature as excessive: everything is exceeded by the forces which constitute it. There is always an excess of the signified over the signifier: rabbits, foxes, cats and so on overflow their nouns.

Stories of "pest" species are narrated by conservation managers in topographical frames of "numbers, distribution, movements, and connections across Euclidean surface space" (McFarlane, 2016, p.632). For instance, the negative economic impact in Australia of feral populations of pigs, foxes, cats, rabbits, goats, dogs, camels, horses and cane toads is estimated at over AUD $720 million annually (NRMMC, 2007). It is this "excess of achievements" (Despret, 2016), represented by humans, which is regarded as problematic. However, rather than asking how these species might be "convinced to leave room for other species" and how we might "negotiate" with animals "who are having fun in the fields that the farmers want to farm" (Despret, 2016, p.73), the "most common approach" is to reduce populations using lethal control (Doherty & Ritchie, 2016, p.1).

I focus on wild dogs, feral cats and pigs, red or European foxes and European rabbits for four reasons: they are introduced species; the *Taking Control* report (CoA, 2005) claims that "the worst pest animal issues facing Australian farmers relate to wild dogs, feral pigs, rabbits and foxes" (p.10); feral cats have been identified as "one of the greatest threats to Australia's land-based mammals" (DOE, 2015a, p.36); all the species are subject to extermination by the toxin sodium fluoroacetate (1080) (see Table 1); and the species are trophically interlinked.

It is recognised that introduced carnivores predate on rabbits. But this predation is only part of a broader trophic assemblage which includes native dingoes and quolls as predators and predated, along with other species of mammals, birds, reptiles and insects, together with humans, who have a greater impact on ecosystems than do non-human species (Hillier & Byrne, 2016). Conservation managers have typically "removed" top- and meso-predators (such as dingoes and red foxes) without consideration

[1] Ettinger (2006, p.201) explains copoiesis as "conductive shareability" which may lead to trauma and loss as well as to flourishing.

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Table 1
Selected introduced species in Australia subject to human extermination.

Name	Species	Date & reason for introduction	Identified as pest species	Estimated population (million)	Est. annual economic impact (AUD $mill)	Est. annual environmental impact (AUD $mill)	Main extermination measures
European/ red fox	Vulpes	1855 hunting, recreation	Yes by 2015	c7	37.5[a] 21.5[b] predation lambs, kids, poultry, ducks & native mammals	190.0[a] cost of control, loss of native species	1080 – eg Probait® Foxoff® De-Fox®, PAPP – eg FOXECUTE®
European rabbit	*Oryctolagus cuniculus*	1788–1857 hunting, recreation, food	Yes	c20	113.1[a] 206.01[b] damage to crops & pasture	–[a]	1080 - eg RABBAIT®, Pindone - eg RABBAIT® Bunnybait®, RHDV - eg Strain RHDVK5 powder, Warren fumigation & destruction
Feral cat	*Felis catus*	c1838 pet, rodentor	Yes, 2015	2–18	2.0[a] insignificant[b]	144.01[a] cost of control, loss of native species: small mammals, birds, reptiles	1080 – eg Eradicat® Hisstory, PAPP – eg Curiosity®
Feral pig	*Sus scrofa*	1788 stock	Yes	13–23	106.5[a] 9.19[b] predation lambs, bird eggs, small mammals, reptiles, damage to crops & pasture, spread disease to stock	–[a]	1080 – eg PIGOUT®, Sodium nitrate – eg HOG-GONE® Warfarin. Pig dogging
Wild dogs	*Canis familiaris*	1788 pet, stock control	Yes	c1	66.3[a] 48.3[b] predation lambs, small mammals, reptiles, poultry, ducks etc, spread disease to stock	–[a]	1080 – eg DOGGONE® De-K9®, PAPP – eg DOGABAIT®, Strychnine

[a] Data from McLeod (2004).
[b] Data from Gong et al. (2009) regarding loss of economic surplus.

of subsequent implications for population numbers of feral cats and rabbits (Marlow et al, 2015; Walsh, Wilson, Benshemesh, & Possingham, 2012). Scientists are gradually recognising that trophic interactions between predator species can reduce intensities of predation of vulnerable prey, such as small mammals and, as such, that lethal predator control may not be the solution to problems of small mammal endangerment (see for example, Doherty & Ritchie, 2016; Doherty et al, 2015; Johnson & VanDerWal, 2009).

Nevertheless, lethal predator control remains widespread in Australia. The Federal Environment, Protection and Biodiversity Conservation Act 1999 provides for the listing of "key threatening processes" to native species and/or ecological communities (DEE, 2016).[2] The behaviours of rabbits, feral cats, feral pigs and red foxes are listed as threatening, with Threat Abatement Plans (TAP) in place for their control and removal. Due to the size of Australia, poisoning is "generally the most effective and lowest cost control method" (DOE, 2015a, p.18) for cats, pigs and foxes, especially when baits are dropped aerially. The draft rabbit TAP (DOE, 2015b) estimates costs of AUD $52 per hectare for poison-baiting, $40–69 for warren fumigation and destruction and $52 for release of biocontrol agents. This last method is regarded as most cost-effective as the rabbit haemorrhagic disease virus (RHDV), administered in suspension or powder form in carrots or oats, self-propagates via rabbit-to-rabbit contact. Whilst there is, as yet, no TAP for wild dogs, the National Wild Dog Action Plan suggests that toxic baiting is the most cost-effective technique available (WoolProducers Australia, 2014, p.57).

Viruses and toxins epitomise the flow of bodies across space and time. Conservation managers employ free-flows of virus bodies and toxins in attempts to eliminate free-flows of rabbits, cats, pigs, foxes and dogs. To date, the toxin of choice has been sodium fluoroacetate (1080). There is no antidote to 1080,[3] the toxin of preference in Western Australia (WA) due to its natural occurrence in several plant species, with some native mammals appearing to have degrees of immunity to it. Banned in most countries internationally, 1080 causes an "inhumane", "prolonged and horrific death" (Marks, 2013, 2014), taking some 3–4 h for rabbits, 4–5 h for foxes, 20–40 h for cats and dogs and 8 h to several days for pigs to die, dependent on toxin concentration. Throughout such time, the animals are "likely to be conscious and capable of suffering" (Sharp & Saunders, 2012a, p.7). Opposition to 1080, from organisations such as the RSPCA, has resulted in development of a more rapidly lethal toxin, PAPP (para-amino propiophenone) for control of foxes, dogs and cats. However, since death from PAPP only occurs "if sufficient quantities of the toxin are eaten and absorbed quickly" (ACTA, 2016, p.12) and "under-dosed" animals can fully recover quite rapidly, use of 1080 remains prevalent.

Time to death for other toxins, such as pindone for rabbits, can be 10–14 days (Sharp & Saunders, 2012b). More widespread techniques for exterminating rabbits include warren destruction

[2] Native species are those present in Australia prior to European colonisation.

[3] For descriptions of lethal effects of 1080 see Marks (2013) and WLPA (2010).

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via ripping by excavators with backhoes (causing suffocation and/or dismemberment), by explosives such as liquid propane gas (LPG) or ammonium nitrate and fuel oil (causing incineration and/or dismemberment) or spread of viruses such as myxoma or RHDV. Increased immunity to myxomatosis has resulted in development of progressively more lethal strains of RHDV, through which animals haemorrhage to death in about 48 h.

Modes of death, as described above, are legal in Australia for non-human animals declared as pests who often fall outside anti-cruelty legislation. A pest may be defined as "an animal that conflicts with human interests … destructive, a nuisance, smelly, noisy, out of place or simply not wanted … that cause more damage than benefits to human valued resources" (Invasive Animals CRC, 2014; online); an anthropocentric definition which reduces the animals to bare life (*zoë*) and signifies the necessity of intervention. The term "pest" as a social construct applied to such animals has emerged from the operation of particular assemblages (of scientists, government officers, politicians, farmers' groups and agricultural enterprises, laboratory and other reports and so on). These operations have generated, and sustain, the legitimacy of exterminating selected non-human animals, through claimed congruence between science, politics and animal corporeality.

There is, moreover, no pre-existing "native" ecosystem to which Australia would return – even with rewilding (see Jørgensen, 2015; Trigger, Mulcock, Gaynor, & Toussaint, 2008) – with the eradication of "pest" species. Ecosystems are dynamic and predators such as quolls, dingoes and Tasmanian tigers would have dramatically affected ecosystems and will continue to do so regardless of pests. Yet, in scientists' representations of Australian biodiversity, introduced species "emerge as threats to an imagined nature [which] … should be here" (Van Dooren, 2011, p.290).

3. Ecologies of toxicity

Foucault's concept of biopolitics is applied increasingly to the study of human/non-human animal relationships and practices of wildlife management (for example, Buller, 2008; Chrulew, 2011; Hillier, 2017; Hillier & Byrne, 2016) in interpretations of a "government of things" (Lemke, 2015, 2016). In contrast to the individualism of "making die and letting live" (Foucault, 1981) of sovereign power, biopower concerns relations between populations of bodies and practices, particularly those related to expansion of populations, in an ethos of "making live and letting die" (Foucault, 2003, p.247), fostering life or disallowing it to the point of death (Foucault, 1981, p.138). The life opportunities of selected beings (such as native species) are enhanced through mechanisms such as State policies and plans which engage negative management and "extraction" (Foucault, 2003, p.246) of other beings (cats, dogs, foxes and so on). Foucault comments that "since the population is nothing more than what the state takes care of for its own sake, the state is entitled to slaughter it, if necessary" (2000, p.416).

Knowledge production is central to processes of biopolitics. Statistical and biological knowledges, for example, open up biopolitical space and powerfully define subjects and objects of intervention. Deleuze and Guattari (1987) regard such knowledges as part of what they term State or major science. Major science is axiomatic, formalised, extracts constants and works with discrete and ideal essences, classification and stratification (Deleuze & Guattari, 1987). It is topographical, following Newtonian logic: pest species threaten losses of native mammals, agricultural stock and crops, therefore pests must be exterminated.[4] Threat Abatement Plans and Strategies ordain the "extraction" of several million non-human animals across Australia, with 2,000,000 cats to be exterminated prior to 2020 (DOE, 2015d).

In Australia, as Marks (2005) comments, "the development of destructive control of vertebrate pests has usually focused primarily on their lethality to the pest and cost-effectiveness". The humaneness of control techniques has received comparatively little attention. In Australia, a humane death is defined by the RSPCA (2016, online) as "an animal must be killed instantly or rendered insensible to pain until death intervenes". However, Sharp and Saunders' influential "model" for pest control states that a "more relevant" definition "is 'a desire to avoid the infliction of unnecessary pain upon wild animals' (Gillespie, 2003)" (Sharp & Saunders, 2011, p.11). The word "unnecessary" here suggests that pain might be conceived as necessary by some actors. "Necessary" pain may be mitigated by speed of death (RSPCA, 2016). A Foucauldian-inspired reading, however, would stress that, if humaneness involves compassion, as suggested in most dictionary definitions, toxic extermination of non-human animals can never be humane.

The "humaneness model" (Sharp & Saunders, 2011) is incomplete and Codes of Practice are voluntary (Sharp & Saunders, 2012a, b, c, d, e). The rabbit TAP (DOE, 2015b) emphasises, in considering control methods, "the most humane technique may not always be the most efficient and effective under the circumstances" (p.21). Reports of rabbits and other animals "fleeing from burrows slight or severely burnt are not uncommon" (Evergreen Rabbit Control, 2016). As Sharp and Saunders emphasise, welfare is only one of the issues to be considered (2011, p.6; p.61).

The feral cat TAP (DOE, 2015d) identifies targeted poisoning with 1080 as having lethal effects on non-target species, particularly carnivores, such as quolls, the Eastern-barred bandicoot, wombats and many birds who might consume bait or infected carcases. Wallabies, pademelons and possums also die from eating 1080-laced carrots intended for rabbits. Domestic pets are also at considerable risk (AAC, 2012). In addition, burrowing animals, such as wombats, goannas and snakes are vulnerable to rabbit warren-destruction practices. "Collateral damage" is accepted as inevitable.

Such thanatopolitics (after Agamben, 1998) is the counterpart of biopolitics. Utilising a scientific plane of reference, conservation biologists argue for the control and/or eradication of, for instance, feral cats, "recognised as a threat to the survival of more than 100 extant native mammal taxa and a major contributor to the extinction of 28 taxa" (Woinarski, Harrison, & Peter, 2014, p.vi). An estimated 15–23 million cats (Borschmann & Groch, 2014) across Australia, predate a projected 164 billion native animals a year (Ham, 2014). Not surprisingly, the Australian Minister for the Environment called for a "10-year plan to eradicate feral cats" (Hunt, 2014) and declared feral cats a national pest.

However, it is not possible to calculate either the numbers of "pest animals" or their predation rates accurately. Both tend to be modelled on extrapolation from small areas. New data suggest a feral cat population of between 2.1 and 6.3 million (Legge, 2016), some 17 million animals fewer than previously estimated, while published images of "a" feral cat's stomach contents of "at least 50 whole mammals and reptiles" (Borschmann & Carlisle, 2014) were later retracted as being the "stomach contents of over a dozen cats" (ABC, 2014). Data are "no better than guesses" (Buckmaster & Hone, 2015, p.50).

Inconclusive data form one reason why all the TAPs emphasise the importance of community education about pest impacts and persuasion of the need for lethal control. The feral cat TAP (DOE, 2015d) notes that "an effective communications campaign will be essential" to gain public acceptance of baiting using "agents formerly considered off-limits", such as toxic Trojans, and to ensure

[4] See Hillier (2017) for discussion of this logic as applied to feral cats.

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the "political will" such a project requires (Read, Moseby et al., 2015, p.85).

The "practical guide" to *Behaviourally Effective Communications for Invasive Animal Management* (Hine, Please, McLeod, & Driver, 2015) suggests that management and control will fail "unless the public is sufficiently motivated and empowered to change behaviours" (p.4). The authors argue that a strategy must increase people's awareness of the problem and engage their emotions. The consequences of not taking action should be highlighted and coupled with advice about how the threat may be avoided, reduced or eliminated. A predetermined "solution" thus becomes "the right thing to do" (2015, p.25). Stripping away any "cuteness", especially from cats, dogs and rabbits, which people know as pets, is an important precondition for public acceptance of lethal control:

> [cats] "a furry killing machine" (Stafford, 2013; online);
>
> [cats] "among the most damaging invasive species worldwide" (Doherty et al., 2016, p.1);
>
> [rabbits] " a national evil" (Peacock, 2015; online);
>
> [wild dogs] "start pulling an animal apart before it's died … evil and cruel" (Howden, 2012; online);
>
> [feral pigs] "diseased and destructive animals wreak havoc" (Cosier, 2014).

Such rhetorical utterances reduce the lives of declared pest species to *zoë;* lives destined to die.

Despite extensive lethal management programs, however, there is little evidence of the benefits for native biodiversity, as Reddiex and Forsyth (2006) point out. In a review of over 1900 pest-control actions, most (67.5%) monitored neither pest nor biodiversity. There is thus no capacity to learn whether threatened species have been directly and positively affected and it cannot be stated that increased numbers of threatened species correlate directly with baiting and other pest control methods.

Following Lopez and Gillespie's (2015) idea of "economies of death" or thanato-economies, I explore the economic logics which render the lives of certain species killable in Australia. Table 1 indicates the estimated annual economic impacts of the five pest species. Costs include production losses due to predation on stock, crop damage and competition for feed, together with associated management costs (baiting, fencing, shooting, research and so on) (Gong, Sinden, Braysher, & Jones, 2009). Environmental costs are based on control costs of impacts on biodiversity. The estimated cost of controlling the five pest species (and feral goats) across Australia in 2003 was AUD $21.5 million (McLeod, 2004). In 2007–2008, Commonwealth and State governments and private landholders spent AUD $122.7 million on management and research (Gong et al., 2009).

The non-human animals have themselves become "resources" from which actors may benefit. Australian bait is produced predominantly by the WA government and two private companies. In WA, the 1080-laced baits, Probait® for foxes and Eradicat® for cats, have been developed and patented and are manufactured by the State government. It could be suggested, therefore, that it has a vested interest in not using the PAPP bait, Curiosity®, but in developing the encapsulated-1080 bait, Hisstory, for use in quoll habitat.

With regard to feral cats, Hillier (2017) demonstrates that the TAP (DOE, 2015d, p.26) anticipates investment of AUD$9 million in bait development, plus annual costs of AUD$1.5–2 million for bait-laying. Over a five-year period, costs for trapping, shooting, fencing (often contracted to the private sector) are anticipated at up to AUD$1.5 million; cat eradication from a large island at AUD$22–44 million plus AUD$300,000 for a quarantine officer; social research and community education cAUD$7 million, and so on. In addition, the WA Cat Act program (funded by the WA government) spent AUD$1.9 million on impound facilities in its first two years. Many local municipalities also contract out trapping, impounding and exterminating to private companies.

Scientists also benefit from awards of research grants and contracts. The Threatened Species Recovery Hub receives AUD$30 million from the Australian Federal government (DOE, 2015c) and the Invasive Animals Co-operative Research Centre received over AUD$10 million in grants in the 2014–2015 financial year (IACRC, 2015). Development of the "Felixer" 1080 gel-based grooming trap has cost cAUD$430,000 (Ecological Horizons, 2015). Traps retail at cAUD$2000. Funded research is ongoing into the lethality potential of live "toxic, Trojan prey", implanting toxins (such as 1080 or cyanide) into species of birds, possums, woylies and rock wallabies. The scientists claim that "deliberate poisoning using live and unaffected 'toxic Trojan prey' enables ethical feral cat management that takes advantage of cats' physiological and behavioural predilection for hunting live prey" (Read, Peacock et al., 2015, p.689).

It is clear that pest control offers economic return to many actors. There are strong connections between surplus populations and surplus value (Hudson, 2011). Non-human animals, especially those declared as pests, are reduced to bodies managed and killed by a system in which the non-human world "becomes a means to the end of capital accumulation" (Castree, 2008, p.147); a form of accumulation by dispossession (Harvey, 2003) of life.

4. Milieu and *environnementalité*

"The milieu is not an average, but on the contrary, an excess" (Deleuze, 1978, p.5 [my translation]). Non-human animals enter into symbiotic complexes (Ansell Pearson, 1999) with their milieu: "the animal-stalks-at-five-o'clock" (Deleuze & Guattari, 1987, p.263). Foucault's (2008) concept of *environnementalité* concentrates on a body's contextual environment or milieu, rather than on the individual body. As I aim to demonstrate below, an understanding of biopolitics as environmental modes of governance (Foucault, 2003) or *environnementalité* (Foucault, 2004, 2007, 2008), rather than modes of environmental governance or governmentality applied to environmental issues, suggests potential for alternative, positive rather than negative, ways of thinking and acting. Engaging *environnementalité* or milieu turns attention to non-codified, non-institutionalised relations of power, rather than the relations represented through classifications, reports and plans and actualised through manufacture and deployment of toxic bait and virus. Where behaviour of populations is managed or governed, techniques would be concerned with the milieu rather than the individual subject (Braun, 2014). Like Foucault, my interest is to trace "the blood that has dried in the codes" (2003, p.56) of classification and strategies.

Foucault (2007) describes a milieu as "the medium of an action and the element in which it circulates" (p.21). He explains in a footnote that a milieu "appears as the intersection between a multiplicity of living individuals working and coexisting with each other in a set of material elements that act on them and on which they act in turn" (2007, p.22). Foucault's relational approach allows exploration of the interactions between *zoë* and *bios*, how they are produced and maintained, and also recognises that agency may be a property of non-humans as well as humans (Lemke, 2015). His interest is in how these issues are articulated in practices of action at a distance of one body on another (Foucault, 2007, pp.20–21), such as of conservation management and the naming and extermination of "pests".

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Foucault, Deleuze and Guattari refuse to subjugate life to its biological form. A relational milieu approach offers a broader understanding of the "play of movements and forces" (De Vries, 2015, p.xv) which constitute life in certain ecological assemblages. The temporal (past/present/future uncertainties, for example, of predation and extinctions) and the spatial (non-human animal habitats, bait dropping zones, parliamentary buildings, laboratories etc.) fold together in conjunctional extermination events.

For Deleuze and Guattari (1987, p.313) living things are compositions of an exterior milieu of materials (geography, climate, ecosystem and so on), an interior milieu of composing elements and composed substances (such as organs), an intermediate milieu of membranes and limits (skin, fur) and an annexed milieu of energy sources and actions-perceptions (eg food, air). Recognising the relationships between milieus, Deleuze and Guattari (1987) write, "not only does the living thing continually pass from one milieu to another, but the milieus pass into one another, they are essentially communicating" (p.313). The milieu of the fox passes into those of the cat and the rabbit, for instance and vice versa.

Several commentators on Deleuze and Guattari emphasise their reference to the *Umwelt* (milieu) of Jakob von Uexkűll (Deleuze & Guattari, 1987). However, what is important is that Deleuze and Guattari go beyond the reductionism of von Uexkűll's specific "milieu-point-of-view" of a tangible, "lived" milieu in the technical sense (De Vries, 2015; Despret, 2016). In such an understanding, non-human animals appear destined to perform predictively, following certain routines in an "objective" world. Deleuze and Guattari's development relates to dynamic, variable milieu with multiple perspectives and foci. What interests the authors is less the environmental space and time of a living being, but how that being encounters and enters relations with others[5]; non-humans and humans.

Milieus are spaces of circulation in which humans intervene with unpredictable impacts. It is at this point that trophism becomes significant. Trophism concerns sustenance of life through nutrition. In Australia, dingoes, dogs, cats, quolls, rabbits, pigs and many non-human species are linked in trophic assemblages. Trophic cascades may occur when assemblages change significantly. For example, having eradicated cats from Lord Howe Island some 30 years ago, the island has been overrun with rats, linked with the extinction of five bird and 13 invertebrate species (Slezak, 2016). On Macquarie Island, Reid (2012) reports that since eradication of cats in 2000: "rabbits have devastated the island" (online). In the absence of foxes, cat numbers increase (Marlow et al., 2015), as do those of wallabies, pademelons and possums who then may become constructed as "pests" (Van Dooren, 2011).

It is increasingly recognised that rabbit is the preferred prey of cats and foxes (Agriculture Victoria, 2016; DOE, 2015e; Doherty, 2015; Doherty et al., 2015), to the extent that cats hunt them, rather than other prey, even when rabbits are scarce (Dickman & Newsome, 2015). "Prey switching" to small mammals could be resorted to when rabbits are absent (Agriculture Victoria, 2016; Doherty et al., 2015; Marlow & Croft, 2016). Little research was undertaken until recently on possible prey switching and trophic cascades initiated by the extermination of "overflow" species. Terborgh's (2015) literature survey concludes that "removing top predators destabilises many systems and drives transitions to radically different alternate states. … Reduction or absence of predation leads to diversity loss and, in the more dramatic cases, to catastrophic regime change" (pp, 114–115). When "released from predation" by the removal of foxes, dogs and so on, it appears that omnivores, such as possums, reach higher population densities and instances of "damage". As Löfgren (2012) states: "the erasure of an object is never complete. There is always a trace effect that is passed on by its absence" (p.17, citing Hetherington, 2004, p.168). There are excesses or overflows to extermination.

The complex inter-relationships between species in milieus are beginning to attract scientists' attention (eg Doherty & Ritchie, 2016; Doherty et al., 2016; Jambrecina, 2010; McGregor, 2016). The DOE (2015b, p.12; 2015e, p.11) acknowledges the primary dietary role of rabbits for foxes and cats and the potential trophic cascades that fox, cat and rabbit controls may influence. The logic appears to be that since cats prefer to eat rabbits, extermination of rabbits will cause cats to decline by reproducing less and/or starving to death (Dickman & Newsome, 2015; Doherty, 2015; Pedler et al., 2016): "If we can knock rabbits down we're pretty sure we can knock cats down" (Johnson, in Glaetzer, 2015; online). Johnson continues: "It's exciting, thinking about using ecology to get what we want" (Glaetzer, 2015). Such an anthropocentric view, however ignores potential for prey switching. In Tasmania it is considered that feral cats could actually be "the lesser of two evils as they keep down populations of other pests such as rats and rabbits" (Glaetzer, 2015; np).

Recognising trophic links between species, there is a growing call for "integrated management". The Australian Pest Animal Strategy (NRMMC, 2007) appeals for activities to be integrated across pest species, while the draft rabbit TAP (DOE, 2015b) laments the Macquarie Island experience referred to by Reid (2012) and comments, "if integrated control measures had been applied, it might have saved considerable flow-on remedial management costs" (p.7).

Integrated management, in a focal resource approach, could be milieu-based. Focal resource approaches "inherently assign the landscape 'agency' in the control program", weighting it as being of more direct importance than the pest animal population (Kearney, MacLeod, McAllister, & Buckley, 2010, p.49). The authors suggest that "simply culling pest animals because they are there, … is often too simplistic" (Kearney et al, 2010). However, milieu in a focal resource approach as described, is regarded as "landscape"; a spatial environment as medium of action, rather than the force of movement in-between in the Deleuzian sense outlined above. The major science "solution" to avoid prey-switching and trophic cascade is for cross-species integrated control, comprising both "top-down" reintroduction of top-predator species, such as dingoes and Tasmanian Devils to suppress "over-abundant macropod prey" (Jones, in Williams, 2011), such as cats, foxes, wallabies and pademelons, and "bottom-up" small native mammal conservation-oriented control. The aim would be to remove all the linked pest species in the milieu, eradicating overflow, rather than one or two selected species (DPI, 2015; Terborgh, 2015).

Van Dooren (2011) terms this strategy a "conveyor belt" approach in which "changes brought about by attempts to remove one species inevitably lead to results that are – at least for some people – undesirable, and thus require further 'active management' to be resolved" (p.291). As death tolls increase, it could appear that the main beneficiaries of such strategies could be those involved in the manufacture and dispersal of toxic bait and RHDV strains. Instead of increasing exterminations in milieus structured and prescribed by numbers and categorisations, I suggest that practices of Foucauldian *environnementalité* could embrace emergent possibilities. This would be an open, flexible space inhabited by a multiplicity of species, including cats, foxes, dogs, rabbits, pigs, other mammals and humans. Practices of *environnementalité* would be concerned with understanding that macro- and meso-predators regulate the ecosystem and acting with the relational spaces of the milieu or life environments of the animals. Improved fire

[5] For an overview of scholarly work on Deleuze and Guattari's interpretation of the milieu, see De Vries (2015, pp.xxiv-xxv, footnote 5).

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management (learning from Indigenous practices) and broadacre farming methods could increase cover habitat for small mammals. More controversially to farmers, whose crops they damage, perhaps rabbits and pigs could be left as diet for cats and humans (Light, 2011), even exported as food (Houghton, 2014).

Rather than engaging in exterminations of healthy non-human animals, a positive Foucauldian practice of *environnementalité* could place less emphasis on 'making die' and more on 'letting live'. Working with the dynamic aspects of milieu might promote new forms of subjectivity (Braun, 2014) and perhaps even "self-willed" practices of leaving things to themselves (Carver, 2014; Fisher, 2003; Mathews, 2004; Monbiot, 2013). I emphasise, however, that a decision not to intervene is itself an intervention and that the idea of a "self-realising" ecosystem which gives meaning to a non-human world is inevitably both anthropocentric and essentialist. As Deleuze and Guattari write, "the self is only a threshold, a door, a becoming" (1987: 249). No thing or being has a "for-itself", but existence within a relational milieu. There is no predetermined model of a "predator", for example; only an immanent and contingent world of relations from which the so-called "predator" emerges through the exterior relations of its elements.

Most authors who advocate self-will argue, notwithstanding, that the practice should apply only to "non-productive land" (Monbiot, 2013) and to native species, such that "some intervention might, of course, be necessary to guide or determine specific outcomes, and avoid unwanted effects from non-native invasive species for example" (Carver, 2014, p.14). Moreover, Mathews' (2016) ideas for a "bio-proportional" conservation practice assign humans powers of normative rationalisation to "calculate" "optimal population sizes" for all species and to "negotiate conflicts of interest … amongst ferals and indigenous species" (p.145).

It would seem impossible to reconcile animal ethics and ecological ethics in practices which acknowledge the moral status of all non-human animals to emerge or "become" and seek to "protect" ecological assemblages from species loss or damage. Self-willed approaches appear impracticable, socially and politically, facing opposition from scientists, conservation groups, farming lobbies and so on, concerned with possibilities of species loss and agricultural damage. Nevertheless, I suggest that there is potential merit in approaches which emphasise the ecosystem – or milieu – as relational, rather than selecting one or a limited number of species. Flourishing and extinction are both aspects of ecosystemic change. There is no "right" ecosystem or "right" assemblage of species (Monbiot, 2013, p.10).

Concerned by "unintended negative impacts" of lethal control which may "cause more damage than good" (Doherty & Ritchie, 2016, pp.2–3), Doherty and others are exploring milieu-approaches in Australia. It has been demonstrated, for instance, that improved grazing and fire management practices can "conserve habitat refuges and boost native mammal populations, even in the absence of direct control of feral cats" (Doherty & Ritchie, 2016, p.4). What the authors refer to as "an exciting new frontier" (Doherty & Ritchie, 2016) in conservation management involves improved understanding of the mechanisms behind predators' impacts on prey, including the conditions of possibility, such as open habitats, which render species prone to predation. There is increasing recognition that habitat management can decrease small mammals' vulnerability to predation and increase the ability for co-existence between species. Doherty et al. (2016) emphasise that management "should focus on reducing the impacts of feral [animals] rather than on reductions in their numbers alone" (p.9). Their recommendation for trialling "control via ecosystem management" (Doherty et al., 2016) exemplifies Foucauldian *environnementalité*: bringing action to bear on milieus rather than on individual non-human animals.

Adopting an *environnementalité* approach to management of feral cats, pigs, foxes, dogs and rabbits recognises and affirms the complex, co-constitutive relationalities in milieus. Unlike a major or State science-based approach of organising milieus by calculating probabilities of prey-switching, bait-resistance, of death and disposal of overflows in a negative, linear, hierarchised, centralised schema (Deleuze & Guattari, 1987), it becomes useful to think positively about milieus as "acentred" ecological assemblages (Deleuze & Guattari, 1987, p.17).

In such thinking, topography is replaced by topological interweaving of interior and exterior dimensions and directions of living beings. The multi-sensualities of being a fox, cat, dog, pig or rabbit and the inscription of their corporeal practices are intertwined with those of humans (scientists, politicians and so on) in what Whatmore and Thorne (1998) term "promiscuous topologies". Topological spatialities are "concerned less with tracing physical mobilities and connections and more with exploring ephemeral processes of presencing and proximity, accounting for the interminglings of interiority and exteriority" (Robinson, 2013, p.10). Attending to forces and materialities in this way comprises Deleuzian minor science. Major and minor sciences often interact, with major scientists attempting to appropriate minor science into formulae, models and categorisations, whilst minor science problematises these structures. Both are necessary. Minor sciences are concerned with "*inventing problems* whose solution is tied to a whole set of collective, nonscientific activities but whose *scientific solution* depends, on the contrary, on [major] science and the way it has transformed the problem by introducing it into its theorematic appointments and its organisation of work" (Deleuze & Guattari, 1987, p.374 [emphasis in original]). This does not mean that major scientific representations of milieus as spaces for "integrated" lethal control should appropriate minor scientific approaches, but that a willingness to experiment with new forms of "solutions", such as improved fire management, farming methods which increase cover habitat and decrease habitat fragmentation and overgrazing, use fewer pesticides and so on, should be engaged alongside a belief in the copoiesis of ecological assemblages. In such an understanding there would be neither overflow nor surplus nor justification for the violence of toxic bating and RHDV.

5. Conclusions: "an animal, a thing, is never separable from its relations with the wild" (Deleuze, 1988, p.125)

Just as Deleuze and Guattari (1994) suggest that geography wrests history from the "cult of origins" (p.96) in order to affirm the power of a milieu, I suggest that conservation management could yield its own culture of origins and the "numbers game" (Wright, 2014) of species thinking and overflow to the power of milieus. For Deleuze (1994), solutions fix something in place, reifying a manner of thinking and acting and masking the problems which need to be uncovered and the questions which need to be asked. Further, available solutions may define problems. Whilst I do not suggest that the availability of 1080 or RHVD has defined the "problems" of feral cats, dogs, foxes, pigs and rabbits, conservation managers should be careful not to allow solutions to determine how problems are framed. Rather than a focus on solutions, therefore, I advocate focus on the processes involved in definition and management of a problem.

Similarly, I suggest a step back from regarding non-human animals as essentialist entities, stratified as species *x*, pest *y* or feral *z*, but instead, to consider the unique composition of their individuated states and the contingent milieus in which they live (Deleuze & Guattari, 1994). A milieu/*environnementalité* approach would decentre specific non-human animals as the focus of conservation biology, whether currently declared pest species or native

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mammals deemed worthy of conservation. These animals are not the centre around which the assemblage "the animal-stalks-at-five-o'clock" turns (Buchanan, 2006, p.317). Everything – the weather, the time, topography, hunger, humans, legislation, chemicals, other non-human animals etc – encounters each other in the milieu. To focus on one, or perhaps a few, species in isolation risks a trophic cascade. Instead, working with milieus is to be within the relation, to pay attention to broader relations, rather than individual bodies.

A milieu/*environnementalité* approach would not seek to predetermine desirable, but unattainable, ecological states similar to those existing prior to European colonisation of Australia. It would afford a non-deterministic wilding based on copoietic regulatory roles of macro- and meso-predators (Jørgensen, 2015). As Foucault (2002) writes: "the animal appears as the bearer of that death to which it is, at the same time subjected; it contains a perpetual devouring of life by life. … [L]ife has left the tabulated space of order and become wild once more" (p.302).

I argue that extermination of declared pest animals is excessive; a surplus or overflow of poison and death. Management/control by extermination affects all milieus: interior milieus of nerves and organs, intermediate milieus of membranes and skin, exterior milieus of ecosystems and annexed milieus of trophism. Conservation managers have codified the spaces of milieus, stratifying by species, zones of aerial baiting, warrens to be destroyed and so on. When understanding has included milieus – such as in focal resources approaches – responses have tended to be for more intervention and human-caused exterminations rather than less. Current research, however, is starting to recognise the compromises inherent in such a strategy.

Milieu/*environnementalité* approaches, concentrating on reducing predator damage rather than predator numbers through habitat management, reduction of human damage to habitats through inappropriate land clearing, grazing, fire and pesticide regimes, recognise the agency of non-human animals. Acknowledging agency, whether as predator, predated, or both, actually affirms the need for habitats where lives can flourish and/or die by being themselves. This entails an acceptance that "overflowing is the rule" (Callon, 1998, p.252).

So, as Deleuze (1978) asks: "might not continuous variation be just an abundance that always overflows?" (p.10, my translation). Practices engaging a milieu-approach would not regard select non-human animal species merely as *zoë*, bare life, which can be exterminated without apology. It could perform a biopolitics which relocates biopower to within the subject. The milieu would be less a medium of action for a means-end strategy than a movement-in-between. Ecological systems managers could pay attention, not to some past or possible future ideal state, but to the progressions through which ecosystems move. In this way, minor science can enrich major science (Deleuze & Guattari, 1987, p.485) to appreciate that milieus comprise matters of "coexistence and competition in a perpetual field of interaction" (Deleuze & Guattari, 1987, p.360).

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