The Institutionalisation of Poison: A historical review of vertebrate pest control in Australia, 1814 to 2018

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ABSTRACT

This paper provides a chronological record of the history of poison in vertebrate species control in south-east Australia, since the first instance was recorded to target dingoes in 1814. Over this time, poison was employed first as a weapon against native wildlife, and then as a curative to address Australia's increasing biodiversity crisis. The paper examines this paradox, and the legacy of Australia's long-term pairing of toxicology and environmental management. The institutionalisation of poison describes the process whereby the use of poison has become normalised and supported by services and systems embedded within a political, legal and social framework. Poison was found an effective tool for clearing lands selected for agricultural production in the early 1800s, and this discovery was followed by a rapid expansion in the application, range, methods of delivery and quantity of poison/poisoned baits applied. Campaigns were targeted towards an increasing number of declared species, and eventually the technology took to the sky in 1947. No region was then beyond the reach of the pest control agencies. Agricultural expansion in partnership with use of broadspectrum poisons has transformed the Australian environment. I argue that the marginalisation and local extinction of numerous native species, can be traced directly back to this industrial catalyst. However, toxicology has taken on a new fight in the 21st century, with poisoned baits reassigned towards the restoration of native ecology, in a program described as "*chemotherapy for the environment*" (Marks 2013). The science of toxicology now targets alien terrestrial vertebrate species believed to be responsible for the biodiversity crisis. This paper examines the historical processes that led to this institutionalisation of poison, followed by many irreversible environmental disruptions and extinction events.

Key words: environmental history, human-wildlife conflict, conservation, dingo, pest control, ecosystem management.

DOI: https://doi.org/10.7882/AZ.2018.025

Introduction

The application of poison predates recorded history, making toxicology the oldest of the sciences. The word toxicology – the science of poison – has its roots in the Greek word *toxon* being the ancient bow or arrow, the tip of which was frequently smeared with poisonous substances to assist in killing the prey, hence the Greek word *toxikon* for arrow poison (Hayes & Kruger 2014, p. 5):

> *Toxicology reflects the development of society: a progression from simplistic to sophisticated, from crude to cultured, from elemental to elegant, from superstitions to scientific, and from taking lives to saving lives … it involves people, animals, the environment and society … it impacts medicine, ethics, law, and societal issues. To fully appreciate the evolution of toxicology we need to address why we poison ourselves, each other, and the environment.*

The intention of using applied toxicology as an environmental architect in Australia was primarily to increase yield on agricultural landholdings, and it has been very successful in providing widespread economic and productivity gains. *Hayes' Principles and Methods of Toxicology* documents the process, summarising (2014, p. 5):

> *The use of pesticides to help feed a growing population by controlling unwanted plants and animals has resulted in increased food production and subsequent better nutrition and health and longer life expectancy … humans are using toxic compounds in a useful fashion to control their environment to their benefit.*

Contraindications to the use of poison in pest control are difficult to quantify, with possible (and many proven) risks to human health, impacts on non-target species, secondary poisoning, environmental uptake, stress/disruption to surviving populations, and extreme suffering to the target species. However, the

moral imperative prevails, and while animal cruelty is considered wrong, society can tolerate it if the benefits of the action are believed to outweigh the costs.[1]

Another theme at work within the poison narrative, I will argue, is a fossilisation of ideas concerning its safety and efficacy. Sociologist Serge Moscovici describes this process of social representation as losing the knowledge of where the concept originated from: "… the more its origin is forgotten, and its conventional nature ignored, the more fossilised it becomes" (Farr & Moscovici 1984, p. 13) – this underlines an assumption 'that we have always used poisons, so they must be OK' …

Methods

I have employed grounded theory as the method for this paper, an inductive, qualitative approach, drawing from archival records – primary sources, archival manuscripts and popular media, through to contemporary literature and scientific publications.

The paper aims to provide a contextual history, with writing integral to this research process. Through recording the details of vertebrate pest control and its social and technological evolution, the paper interrogates this history – why did this conflict happen, where did it happen, what was the motivation, who gained, who lost, what did this symbolise, what was the legacy of this action? From this process, themes have emerged; patterns, systematic analysis, comparisons, evidence of conflict, cultural contradictions, omissions, inconsistencies, etc. that provide evidence that the use of toxicology was formative for Australian agriculture, and the long-term impact of 200 years of agrochemical farming systems needs to be acknowledged when assessing the drivers of Australia's current biodiversity crisis.

1 Wildlife researcher Peter Howard argues in his thesis on Australian constructions of wildlife (2006 p. 206), that the moral order in wildlife management is flawed, because it does not take into account the needs of future generations (for humans and animals) for example, policy and legislation supporting the eradication of dingo populations due to their predation on livestock, does not take into account the long-term impact of these controls on the species or the functioning of the native ecosystem. There is both a moral obligation to nature, and moral order in nature; nature can be good or bad, for example 'native' versus 'feral' wildlife. "Ultimately, of course, the position is untenable: resources are not inexhaustible and humans do not exist outside of nature …" (Howard 2006, p. 207)

A brief history in poison

"*1788 represents one of the most momentous dates in the worlds ecological history*" (Tom Griffith 1986).

Pierre-Joseph Pelletier was born in Paris, 22 March 1788 (Buckingham 2008), just two stormy months after the first fleet of British marines and convicts had landed at Port Jackson, Australia. Pierre-Joseph's father, Bertrand Pelletier was 24, and carrying out his investigations in mineral chemistry in the *laboratoire* at the rear of the family's Pharmacy Pelletier, 48 Rue Jacob (Figure 1), just four years after he had gained the title of Master Apothecary and married Marguerite Sedillot.

The infant Pierre-Joseph survived the famine that struck that year, July 1788, when severe hailstorms – the worst in 40 years – destroyed the year's crops across France. Paris battened down the hatches to endure a long, cruel winter. The cold was the last straw for a starving population under the oppressive rule of the (heavily indebted) French monarchy. A combination of climatic, economic and political instability resulted in the uprising across the country, and the French Revolution was underway by 1789. Out of the social and political turbulence, technological advances were rapid and science took central stage for the emerging Republic. Pierre-Joseph's arrival was timely. The *Museum d'Histoire Naturelle* was established just 10

Figure 1: *Pharmacie Pelletier* 48 Rue Jacob. Source: Google Maps 2017

minutes by horse and cart down the Boulevard Saint-Germain by the time that he started school.

Pierre-Joseph was nine when his father died, and he inherited both the apothecary and Bertrand's aptitude for science and invention. Graduating with *docteur es sciences* in 1812, he was appointed Professor of Natural History of Drugs three years later at the *Ecole de Pharmacie* (Buckingham 2008, p. 50) (Figure 2).

In 1818, working in Bertrand's Laboratoire, in collaboration with the chemist Joseph-Bienaimé Caventou, Pierre-Joseph succeeded in extracting "beautiful but sinister crystals" from the plant Nox vomica (Buckingham 2008, p.51). This discovery revolutionised toxicology- it enabled mass production of a highly toxic, stable and cheap poison, and the crystals were soon to be exported *en masse* around the world. Pierre-Joseph became director of his own chemical plant in Clichy on the outskirts of Paris (Figure 3), and factories were soon launched in England. The export and demand for the crystals appeared inexhaustible.

The poisonous substance, known as strychnine, was to become a basic component in the Australian farmer's tool kit. Strychnine was the main ammunition in the frontier war against Australia's intractable wildlife – targeted mainly towards the dingo, as landholdings and agricultural production expanded across the continent (Trollope 1873, p. 500):

> *The squatter attempts to rid himself of the dingo by poison, and consequently strychnine is as common in a squatters house as castor oil in the nursery. On many large runs carts are continually being taken round with baits to be set on the paths of the dingo. In smaller establishments the squatter or his head-man goes about with strychnine in his pocket and lumps of meat tied up in a handkerchief.*

The prevailing wool industry was soon expanding at a rate only possible in partnership with the wide-scale application of lethal poisons targeting unwanted native wildlife – and eventually to be redirected towards a superabundance of acclimatised species, effectively establishing an economy irreversibly dependent on agrochemical farming systems. The quantities of poison produced for environmental use worldwide were staggering, with hundred of tons of *Strychnos nux-vomica* seeds being imported each year to

Figure 2: Pierre-Joseph Pelletier (after Elisa Desrivières) by Catherine Buisson 1930. Source: Wellcome Library

Figure 3: View of the factories from Quai de Clichy by Vincent Van Gogh 1887

the United Kingdom in the 1890s (Buckingham, 2008). At the turn of the 20th century, Britain was producing over five tons of pure strychnine per annum. That is sufficient to poison 100 million people. Medical doctor and author John Buckingham (2008 p. 209) asked the question in *Bitter Nemesis* – 'Where did it all go?' (see Timeline).

New South Wales

Before the development of strychnine, the use of poison in the Australian penal colonies had been largely curtailed due to the fear of the deadly substances falling into the wrong hands (*Sydney* [a], 1814 p. 6). However, arsenic was first trialed against the dingo (*Canis dingo*) in 1814. The Sydney Gazette published the first report in the media, with a detailed account of a Gentleman farmer on a large landholding in the Nepean district. The farmer had discovered an ailing oxen in the grip of a pack of dingoes. He drove off the dingoes, then laid out the body of the (then deceased) oxen. He made slices into the carcass, and rubbed arsenic into the exposed flesh and joints. After leaving the carcass out overnight, it was evident the next morning that the dogs had taken the bait. On the following night, a few remaining dingoes left rows upon rows of footprints in the sandy soil surrounding the carcass, but they did not touch it. By the third night both the footprints and the dingoes had vanished and they were not seen again (*Sydney* [a], 1814, p. 6):

> *… the inference to be drawn from which is, that the whole of the brood infesting that spot had received the poison, and perished in their recesses. The carcass was afterwards buried, lest any useful dog should be attracted by it, and also become its victim. In this Colony we believe the above experiment to be novel.*

The farmer's use of poison and his technique of deception caused concern in the settlement, many worried (justifiably) that in the wrong hands, any access to the deadly substance could backfire on the colony (*Sydney* [a], 1814, p. 6):

> *Its efficacy cannot be well called into doubt; but there are at the same time such powerful objection to its obtaining as a fixed practice, that it would be hard to give an opinion whether the remedy might not be attended with as great or greater evils than the disease itself.*

A week after the article was published, the Sydney Gazette reported that the experiment had been considered a success. Local livestock-breeders were looking for supplies of arsenic. The newspaper was in support of the action and advised the readers (*Sydney* [b], 1814, p. 2):

> *[Arsenic] can at this time be purchased in Sydney at the rate of 10s per lb, and half a pound be found sufficient to poison all the dogs in any one single neighborhood. Any Proprietor of stock wishing to know, by line or otherwise, where it is to be obtained, will find the information they require at the Gazette Office.*

Arsenic (**As**, number 33 on the periodic table) is a metal, the lethal element often used in insecticides and vertebrate poisons. It has an ancient history; professional poisoners had come into existence in the early days of Christianity and by the 17th century there were specialised schools teaching the deadly arts (Hayes & Kruger, 2014). Popes, emperors and kings had a long tradition of keeping their personal cup bearers close at hand to avoid untimely death. Instructions in the "toxicology and mutual improvement in the art of marital removals" had also become a concern to the church by this time (*The Beaten Track*, 1929, p. 8). Throughout the 19th century

Table 1: Size of the national sheep flock 1800 to 2015, Australian Bureau of Statistics (2011 & 2015).

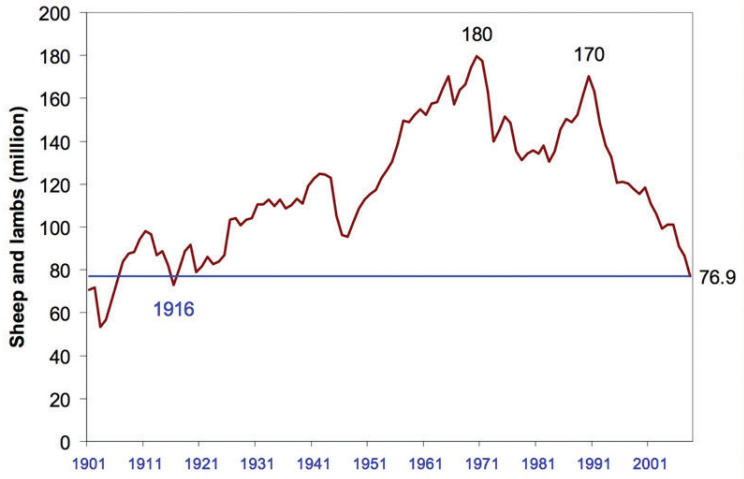


Figure 1 **Size of the Australian sheep flock. Source: ABS**

Year	Sheep numbers
1800	6124
1820	120,000
1850	16 million
1860	20.1 million
1892	106 million
1903	54 million
1970	180 million
2015	70 million

an estimated one third of all criminal cases that involved poison, used arsenic – it was readily available and, at that stage, any residues were hard to detect (Acocella, 2013). The discovery of strychnine in 1818 provided a safer alternative for the new colony to employ.

The sheep flock increases

The expansion of the agricultural industry in Australia was rapid. From the time that fine wool became recognised as the major export product for NSW in 1822, until 1850, the national flock numbers increased from 120,000 to 16 million (Table 1).

The expansion of agricultural holdings across the country was only possible in partnership with lethal controls. Strychnine was commercially available by 1832 (*Advertising*, 1832, p. 4).

Between 1830 and 1840 there was a shortage of labour in the colonies, and squatters were moving on to larger properties. As a result, shepherds were expected to care for vast sheep flocks. 3000 sheep per shepherd was considered reasonable, and by the 1850s, 4000 sheep per shepherd was the common practice (Parsonson 1998, p. 70).

In 1836, George Russell established a sheep run near Geelong – introducing 3000 sheep to the area where there had previously been a serious problem with native dogs. Russell effectively eradicated the dingoes using cheap and plentiful strychnine baits – by 1850 he was stocking 70,000 sheep on the property. By this stage, dingo eradication had became embedded in law (Parsonson 1998, p. 243):

> *By 1852, the dingo, or native dog, had become a menace to sheep farmers. An act (16 Victoria No. 44) was passed which encouraged destruction of the dingo and allowed people to lay poison along mutual boundaries, the cost to be shared by neighbors.*

The introduction of fencing at this time coincided with a shortage of skilled workers and shepherds after gold was discovered near Ballarat in 1851 (Parsonson, 1998). Mining offered better prospects for lower paid workers, and they flooded to the gold fields. New markets for meat and produce emerged, and Victoria prospered.

This rapidly changed farming practices to meet supply and demand. Protecting the flocks was paramount (Parsonson 1998, p. 169):

> *Now there were few shepherds and fences were gradually replacing them, but new controls were also required to curb the dingo menace. This was achieved through the use of poison baits (strychnine). Once the dingo menace had been eliminated, sheep no longer needed to be guarded, and the change from shepherds and folding systems to permanent paddocks, yards and sheds for handling sheep meant great cost reductions in wool production.*

The changes to the landscape were rapid and farming practices and advances in technology evolved side by side, developing an industry irreversibly dependent on poison to control pests species – with the target species moving from predators to the resulting super-abundant herbivores over time. Labilliere (1878) recalled of 1859:

> *Kangaroo and emu were also numerous in the neighborhood in the early days, but had almost completely disappeared before the time to which the writer's recollection reaches back. Dingoes, or native dogs continued for some years to be destructive, but were finally exterminated by means of strychnine ... The writer well remembers when, in order to protect sheep from being attacked by dingoes, it was indispensable to have them folded at night, and for the shepherd to sleep beside his flock, in a movable wooden structure, called a watch-box, built on wheels, so that it might be moved when the hurdles of the fold were changed to fresh ground, as they were every day or two.*

The outcomes were unpredictable. Having effectively eliminated the dingo from extensive areas, Australian ecological and cultural systems were disrupted.

Despite numerous attempts to introduce rabbits (*Oryctolagus cuniculus*) to Australia, along with other species favoured by the acclimatisation societies, it was not until 1859 that the rabbit population managed to get a stronghold on the country. This occurred not far from Russell's sheep run, in the Geelong district where the dingo population had been successfully eradicated in the previous decades. Thomas Austen famously released his rabbits after they had made port on Christmas day 1859, having survived the journey from England along with five hares, 72 partridges and a number of sparrows aboard the brig the *Lightening* (Cooke, 2014, p. 29). The property was Barwon Park, Victoria; 8 years later the rabbit population was so well established that Prince Alfred managed to bag 416 rabbits on the property in less than 4 hours shooting (Cooke, 2014).

In South Australia, *The Advertiser* lamented in April, 1877 (*The Rabbit Question*, p. 4):

> *Owing to the dingo and the native cat, the rodents [rabbits] made no headway for a very long time, but as strychnine did its work, and the dogs and cats disappeared, the rabbits increased enormously, and then it was seen what an evil had been imported and established in our vast territory … The rabbit was thought a most desirable addition to our wild animals, affording fresh game for the sportsman and an additional article of food for the community ... We have destroyed the balance of nature in two ways simultaneously, by destroying the carnivore and introducing a new herbivorous animal of immense reproductive powers. The kangaroo nuisance in various portions of the province has been caused by the destruction of the wild dogs, and the dying out of the natives, who now rarely hunt the larger marsupials.*

Rabbits had joined the dingoes on the list of serious pests, and the "Rabbit Nuisance Act of 1883" was established. The rabbit is still described as "Australia's most widespread and destructive environmental and agricultural vertebrate pest" 136+ years later (*European Rabbit*, 2011).

Adopting alternatives to poison was suggested as early as the mid-1800s. Using guardian animals was proposed in 1856. The following account was published in the North British Agriculturalist and the Colonial Times (*The Wools of NSW, 1856*, p. 2):

> *Besides the use of strychnine in poisoning the dog, it is a question which experience can alone determine, how far the practice in South America of training dogs to remain with the sheep night and day, and to protect them from the attacks of all wild animals, may be adopted in Australia. The dogs used for this purpose are early trained. When pups, they are taken to the sheep runs, a nest of wool is made for them, and they are regularly fed and kindly treated. The result is that they remain with the stock, and upon the appearance of any danger, the sheep range up behind the dog, which gives battle manfully to all intruders ... In the Pyrenees, these dogs protect sheep from wolves, and generally from bears. They are more than a match for the wolf … These dogs could be easily introduced into Australia, as they can be obtained with great facility in the South of France.*

Goats were also suggested, but eradication appeared to be the only strategy seriously considered to combat the problem. Poison baits were redirected towards new groups of 'thieving rogues' – parrots, flying foxes, grazing marsupials. Pest control was described as having moved from "*pragmatic to apocalyptic*" over the course of the century (*Experiments on Flying-Foxes with Explosives*, 1890).

Another unanticipated environmental disruption coinciding with the widespread lethal dingo control, was the emergence of regular rat and mouse plagues. In 1847 a rat plague was first recorded after record levels of rainfall (Rowe, 2011), and many are mentioned after 1870, including South Australia 1871; Queensland 1880; central west Queensland 1883, central Queensland 1887; Alice Springs 1904. Records indicate rat or mouse plagues have occurred every four years on average since 1900 south of Australia's 5.516 km dingo fence (*FAQs about Mouse Plagues*, CSIRO 2003) – the indicator level being an excess of 1000 mice per hectare. This regularity of plagues is unique to just two environments – Australia and the north-western plateau of China, though New Zealand is catching up. From records it appears that the plagues are commonly the black rat (*Rattus rattus*) and the brown rat (*R. norvegicus*), and house mice (*Mus musculus*), but there are also 66 species of native rodents in Australia. The house mice "frequent the highly modified agricultural habitats not used by native mice" (*FAQs about Mouse Plagues*, 2003, p. 2) perhaps making them more susceptible outbreaks.

Rat plagues were known to have occurred prior to European arrival in Australia (Anon. 1871), however they were rare events, without the severity and frequency of those recorded since 1847, as can be ascertained from both Euro-Australian records and those of the local Aboriginal people.

The Ballarat Courier, 27 April 1871, published the following report from a region north of Port Augusta, South Australia (Anon, 1871, p. 2):

> *The army of rats appears to have spread over a large portion of the North, and Mr GL Debney, writing to us from Mundowadana, on 12th April, remarks that they are in swarms infesting every waterhole and spring, The creatures are of the common brown variety, aboriginally termed my-ar-roo, and by the [Aborigines], who consider the visitation as a windfall, are regarded as a great dainty. The natives state that they seldom visit that part of the country, the latest instance having been many years ago, and before whites settled in the Far North. On the last-remembered occasion they came from the east and north-east, destroying all the feed, and after staying about six months left as suddenly as they arrived. In some places their tracks cover the ground for miles. Our present informant remarks that they seem chiefly to attack the grass roots, and although he has been more than ten year in the North, this is the first time he has seen them.*

The use of poison to successfully eradicate the dingo from the landholdings was now applied to curb the rodent and herbivore plagues. A report of a rat plague published in *The Telegraph* in 1883, indicates the scale of the disruption. This account is from Vindex station, not far out of Winton, central west Queensland (*Messrs. Griffith and Dickson's Tour*, 1883, p. 5):

> *Among the stories told about the place is one to the effect that three years ago there was a terrible rat plague on the station. The rats appeared in thousands, destroyed all the vegetables in a garden on the bank of the creek, hamstrung young lambs just after they were dropped, ate the hair off peoples heads while they were asleep, consumed boots while the owners of them peacefully slumbered unconscious of the depredations being committed at their bedside, ate or damaged saddler or harness, and then vanished as suddenly and mysteriously as they came.*

Plagues have increased in frequency, reportedly encouraged by monocultural environments such as the southern wheat-lands (Olsen, 1998). Throughout the 19th and 20th century, rodents have thrived in the altered agricultural landscapes, with the main influence on their populations being, until recently, weather.

Drought, depression and distribution carts

Sheep distribution in northern Australia reached its largest dispersion on record by 1883, and from the end

of the 1880s, it began contracting to the current level of distribution – exacerbated by droughts, the 1890s depression, poor markets, transport costs, lack of water sources, and the difficulty of controlling wild dogs on the remote land holdings (Parsonson, 1998). By the early 20th century, the dingoes were wise to the traps, poisons and guns of the Euro-Australians and were becoming increasingly difficult to kill. The following account was from northeast Victoria, 1917 (*The Wild Dog Pest*, 24 May, p. 7):

> *… the animals are swift, extremely shy, and cunning beyond belief. The average man, try as he will, has no chance of poisoning the average dingo. Out of this region an expert poisoner enjoys as much fame as a great footballer or brilliant lawyer.*

Increasingly sophisticated machinery was making distribution of poisons more widespread, efficient and deadly. Horse drawn poison carts were designed initially to dispense dingo baits around the periphery of the large land holdings, with newer carts designed primarily to target rabbits (Figure 4). The first patented device was in 1887 by Lascelles and Anderson and by 1920 the carts were being used in the thousands – the 'Australian Pastoral Company' had twelve poison carts working continuously on the Southern Queensland Stations (Rolls, 1969, p. 137). Strychnine, phosphorous and arsenic were dissolved and poured over crushed oats, pollard and syrups to curb the rabbit population. A noted problem was the imprecise nature of the poison and indiscriminate killing that took dogs, goannas, foxes and dingoes – all naturally occurring predators of the rabbits (Wilkinson-Flicker, 2010).

The prize winning IXL Fortescue patented machine was the most popular machine of the day and won many prizes in the field trials. This machine was mounted on a cart and plough, and cut a shallow trench, dispensing the baits along the pathway – phosphate poison mixed with molasses and bran. It was believed to be safe from stock as the poison was lightly buried. The obituary for AJ Fortescue, responsible for the design and distribution of the IXL Great Automatic Patient Pollard Distributor, stated that more than 10,000 of the machines had been produced at his factory in Arncliffe, Sydney (Figure 5).

The elimination of the dingo launched an unanticipated (and unconventional) industry in competition with British farming aspirations. From the 1890s through to the end of World War II, rabbits provided a thriving trade in meat and fur for Australia. The industry managed to prosper through times of drought, war, and economic downturns – events that severely impacted on the sheep and cattle industries and resulted in decades of hardship for pastoralists (Eather & Cottle, 2015). In the 1890s when the rabbit industry was first expanding, the national sheep flock decreased from 106 million to 54 million (1892 to 1904).

Rabbit canning factories and processing plants were established in NSW and Victoria, and the industry provided opportunities to make a good living to those without land title, as well as supplementary income for those with permanent land holdings (Eather & Cottle, 2015).

At Longwood in north-east Victoria, a large canning factory began operations in 1891, and within twelve months was employing 75 men at the processing works with a further 150 men engaged in trapping the rabbits (Eather & Cottle, 2015). On a good day, the factory could turn out 4000 tins of rabbit, with meat from about one and a half rabbits per tin. Trappers were paid four pence per pair of rabbits. By 1898, the factory had closed down largely due to competition from the rising export trade in frozen rabbits.

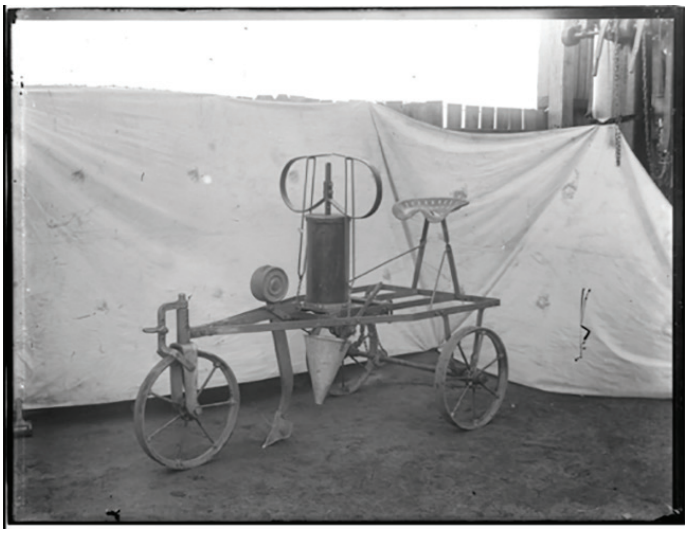


Figure 4: "Toxicon" rabbit poison distributor, made by The Clyde Engineering Co. Ltd, Granville, New South Wales, Australia, 1900-1945. Reg. 88/297-578. Source: Powerhouse Museum

Figure 5: Trade catalogue advertisement for the IXL poison dispensing cart, 1905. Source: National Library of Australia, Rabbit control ephemera collection

The rabbit exporters paid double the money for rabbit carcasses and the canning factory could not compete.

Brian Coman's monograph *Tooth and nail : The story of the rabbit in Australia* (2010) records the turbulent history in detail (pp. 102–103):

> *Demand for rabbit meat greatly increased during World War I and, by 1917, trappers were receiving as much as a shilling a pair. This was three times the price paid in the 1890s. Early in 1917, the commonwealth government, acting on behalf of the British government, purchased large numbers of carcasses for the army … There was some agitation to suspend all poisoning of rabbits in Australia so that the trappers could operate more efficiently and keep up with the heavy demand. The rabbit control authorities stood their ground and poisoning continued.*

Many trappers were able to invest in property with their profits from the rabbit industry, and no one in Australia went hungry during the war years with the endless supply of rabbit meat at hand (Edwards, 2014). "In 1929 the rabbit industry was reported to be Australia's largest employer of labor" (Eather & Cottle, 2015, p. 1). Over 20,000 trappers worked full-time trapping for carcasses or skins, or poisoning for skins. Thousands were employed in numerous freezer works located in rural towns and capital cities: grading, sorting, packing, skinning and transporting carcasses by the tens of millions.

In addition there were thousands employed in the fur industry, and selling rabbit meat directly to the public through street stalls and shops, making felt hats out of the rabbit skins (Eather & Cottle, 2015). Even the 'scraps' went into fertiliser, animal feed, and to make gelatin. Each rabbit carcass – trapped or poisoned – was worth money and rabbiters worked independently as suppliers, earning a good income.

Around four billion rabbit skins were exported between 1904 and 1947. An estimated 27 million rabbits were consumed by Australians each year during the 1940s (ABC, 2015). Australian soldiers in World War II marched into battle wearing slouch hats made of rabbit skins – ten rabbits per hat, and Australia produced 5,500,000 hats during the war (O'Brien, 1947).

Wool remained the nation's major export earner, but income from wool ended up in relatively few hands, while the rabbit industry provided cash on a daily basis to thousands of trappers and workers. The profits from the industry stayed in the local economy, and "unlike other rural industries, the rabbit industry prospered during war, depression and drought"(Eather & Cottle, 2015). In a study of the industry published in 1982, *Last of the Lantern Swingers. A story of the rabbit industry in Sunraysia*, historian G B Eggleton concluded that "the industry was a far better solution to the rabbit problem than either poisoning or myxomatosis."

Competition between the rabbit industry and the sheep industry played out during the first half of the 20th century. It was a war between landowners, government, itinerant trappers and others involved in the rabbit harvest (Coman, 1999). It was fuelled by the increasingly sophisticated machinery of the poisoners, working in opposition to the lucrative rabbit meat and fur market.

The advances in technology after World War II were game changers for the Australian pest management; aerial baiting, biological control and new pesticides transformed agricultural practises and the management of National Parks and Conservation zones.

The development and release of the myxomatosis virus finally brought an end to the sheep and rabbit wars. The virus escaped during trials (as did the later calicivirus, 1995) by the Commonwealth Scientific and Industrial Research Organization in 1950 (Olsen, 1998; Rolls, 1969, p. 233-246), and within three years the sheep industry was reaping the profits. The *Townsville Daily Bulletin*, 6 October 1953, announced under the heading *Wool Means More Than Rabbit Fur:*

> *The use of myxomatosis as a rabbit killer had added an estimated £30,000,000 to the value of Australia's sheep and wool industry for 1952-53, said Mr Ewen Waterman, Chairman of the International Wool Secretariat, London.*

The Victorian Fur Skin Buyers Association was protesting that myxomatosis had practically wiped out the export trade in rabbit fur, comments received with disregard by the wool exporters (*Wool Means More Than Rabbit Fur,* 1953):

> *Mr Waterman said he had shed crocodile tears when he read the complaint. The large-scale use of myxomatosis was one of the most important developments in the history of grazing in Australia and its effect would be cumulative. The economy of Australia, Mr. Waterman pointed out, rested heavily on the sheep and wool industry not on the rabbit fur trade industry.*

Conclusion

The history of dingo baiting can be dated back to 1814, and by the mid-1800s the systematic eradication of the dingo and other native flora and fauna had become an essential process of the colonial project. This allowed for the vast expansion of agricultural zones, and drove up high stock numbers on the land.

Negative impacts of these interventions had been recorded by a concerned media, and there was immediate recognition of the costs to native ecology as a consequence of the systematic use of poisons on landholdings. However, these voices of objection failed to make any impact.

Removing the dingo from the native environment altered population dynamics, allowing for native herbivore

TIMELINE

Size of national sheep flock:

1811 — 6124 sheep

Samuel Marsden announced the first 'Plan for the Destruction of the Native Dogs'.

"The first settlers were enthusiastic poisoners. Everything that seemed at all likely to be troublesome was poisoned – the wombat, the rat kangaroo, the wedge tailed eagle, any species of hawk, the raven, the dingo (which certainly could not have been lived with), the native cat and the tiger cat for poultry raiding and the goanna for egg-eating" (Rolls, 1969, p. 18).

Dingo 1803-1810 by C.A. Lesueur. Muséum d'histoire naturelle du Havre

1814

First recorded use of arsenic to poison dingoes (Sydney Gazette, 26 November).

Pierre-Joseph Pelletier. Oil painting by Catherine Buisson

1818

Pierre-Joseph Pelletier's discovery of strychnine in crystal form revolutionized the production of poison.

120,000 sheep

1832

Strychnine was advertised for sale and rapidly adopted into the agricultural tool kit.

"The native dog has been almost exterminated in the more open parts of Victoria; and other animals formerly his prey have multiplied exceedingly. I have seen mobs of kangaroos in the Western district so large as to defy even an attempt to make an approximation to the numbers" (Frederick McCoy, 1866).

16 Million sheep

1847: the first significant rat plague was recorded. By 1900 plagues were reccuring every 4 years.

1850

Wire fencing was first available in the colonies. Baiting of dingoes became manditory on boundaries.

20.1 Million sheep

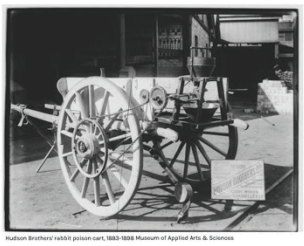
Köhler's Medicinal Plants 1887

Hundred of tons of Nox vomica seeds were being imported each year to the United Kingdom in the 1890s for the production of strychnine for environmental use (Buckingham, 2008). At the turn of the 20th century, Britain was producing over five tons of pure strychnine per annum. That is sufficient to poison 100 million people. Medical doctor and author John Buckingham (2008, p. 209) asked the question in 'Bitter Nemesis'– "Where did it all go?"

1883

1883: Rabbits join dingoes on the list of noxious pests with the drawing up of the "Rabbit nuisance act 1883".

1890s



Hudson Brothers' rabbit poison cart, 1883-1886 Museum of Applied Arts & Sciences

106 Million sheep

Horse drawn poison carts; these carts were designed initially to dispense dingo baits around the periphery of the large land holdings, with later carts designed primarily to target rabbits. The first patented device was in 1887 by Lascelles and Anderson and by 1920 the carts were being used in the thousands.

The death toll from the pursuit of "pests" was immense. Keith Hancock examined the annual reports of the chief inspector of stock in the Monaro region of New South Wales and found that, from the 1880s to 1900, they contained astonishing tallies of slaughter. In most years, wallabies and kangaroos were killed by the millions; kangaroo rats in hundreds of thousands; possums, bandicoots, paddymelons, and crows in scores of thousands; and wombats in the hundreds. The killing was sustained and indiscriminate, and all aimed at saving crops and pasture" (Garden, 2005).

1900

54 Million sheep

"The squatter attempts to rid himself of the dingo by poison, and consequently strychnine is as common in a squatters house as castor oil in the nursery. On many large runs, carts are continually being taken round with baits to be set on the paths of the dingo. In smaller establishments the squatter or his head-man goes about with strychnine in his pocket and lumps of meat tied up in a handkerchief" (Trollope, 1873).

1929

In 1929 the rabbit industry was reported to be Australia's largest employer of labor.

LEPUS WHITAKERI. Illustration: Joseph Smit.Proceedings of the Zoological Society of London 1902

1947

Low-level dingo baiting in western Queensland 1958.

Pest control takes to the sky. Aerial baiting distributes poisoned baits by the millions.

1968

In 1968 the first comprehensive research into its effectiveness was undertaken by the CSIRO (Newsome et. al., 1972).

180 Million sheep

The dingo is placed on the IUCN Red List of Threatened Species 2008.

2008

70 Million sheep

populations to increase dramatically. Mouse plagues became common events both in response to the lack of predation, and their ability to thrive in monocultural environments. Wild herbivore populations exploded – both native and acclimatised, followed by more poisoning. Extinctions of the most vulnerable fauna followed.

The introduced rabbit population became established in the absence of an effective terrestrial predator by 1859, and became a prolific agricultural pest – at the same time as providing a lucrative economic market for itinerant workers. Essentially it functioned as a democratic industry, a resource available to all – affording social mobility to marginalised communities, at direct cost (in lost revenue) to the conventional sheep and cattle industry. The damage caused to the environment by rabbit populations was substantial, however it would be necessary to estimate the impact of sheep and cattle production on native ecology, before drawing conclusions about which economy was responsible for the most damage.

Pest management is greatly influenced by cultural, political and economic factors. The target species such as dingoes, rabbits and rodents, have been held responsible for impacting on agricultural production, causing environmental degradation, and threatening biodiversity. The impact of their removal from the environment has rarely been considered in assessments of eradication projects, and the BACI (data before-after, control-impact) is often non-existant or extremely difficult to access. As a consequence, issues such as the wider impact of species removal on ecosystem function and biodiversity, the ethics of using poison to eradicate sentient species and the trauma suffered by animal communities as a consequence of lethal control methods are all areas that require critical examination, both through a historical and contemporary lens.

Acknowledgements

Thanks to BREW (Bush Retreats for Eco Writers) for a writers residency while working on the formative research for this paper. Thanks to Barbara Holloway and George Main for their encouragement. Also thanks to Nick Reid, Ian Reeve and Don Garden for their helpful comments, and to Adam Miklosi and two anonymous reviewers for their constructive advice.

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