Theme - Environment and resources

MANAGING WALLABIES ON KING ISLAND: MANAGEMENT THAT WORKS

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Abstract

Since 1995 populations of wallabies, predominantly Bennetts wallaby (Macropus rufogriseus), and to a lesser degree Tasmanian pademelon (Thylogale billardierii), have been abundant in King Island landscapes, impacting natural and agricultural environments. King Island lies between Tasmania and mainland Australia, encompassing 110 000 ha of predominantly flat landscapes, some plateau country, and a large extent of cleared pasture land with remnant bushland. The island boasts quality beef and dairy production, and pristine natural environments. To manage wallabies, and their browsing impacts on natural and agricultural environments in 2013 a Wallaby Management Coordinator was employed by the Tasmanian Government's Department of Primary Industries, Parks, Water and Environment. Management encompasses wallaby-proof fencing, shooting, education and neighbour co-operation. Seven properties initially engaged in wallaby management. Today thirty-one properties engage in wallaby management, and eighty have Crop Protection Permits. In six years an average of 71 667 wallabies have been culled per year, and 240 kilometres of wallaby-proof fencing has been installed. Properties engaged in wallaby management are reaping the rewards, with one property reporting a 75% increase in production in three years of wallaby management. The future profitability of agricultural production relies on continual management of these species.

Keywords: Management integrated agriculture production wallaby macropod

INTRODUCTION

King Island lies in the Bass Strait between mainland Tasmania and Australia. The island is approximately 65 km long and 25 km wide, encompassing approximately 110 000 ha comprised of four main environments; plains, swamps and lagoons, plateau country and coast lines (Department of Primary Industries, Parks, Water and Environment, 2012). Historically agricultural grazing first occurred in 1855, progressing with dairy industry expansions in the early 1900s. Today the island produces quality beef and dairy products (Department of Primary Industries, Parks, Water and Environment, 2012; Turner, 2005). Natural environments are important aspects of the island, and landholders work to protect riparian and forest vegetation, as the island is home to multiple endemic and threatened species of flora and fauna (Richley, 1984; Turner, 2005).

Historically wallaby densities were low. On 28 August 1929 the *King Island News* reported there were very few wallabies, and they were thought to be extinct. Hunters rarely saw wallabies, and they were rarely caught in snare traps (King Island News 1929). The combination of high rainfalls, historic land clearing and improved agriculture practices, have led to increased wallaby densities, and a corresponding progressive increase in the impacts of wallaby browsing on natural and agricultural environments (Norton and Johannsohn, 2010). Anecdotal evidence suggests that in 1995 King Island experienced a population explosion of 250 000 Bennetts wallabies (*Macropus rufogriseus*). More recently populations were estimated at between 440 000 and 535 000 Bennetts and 18 000 to 31 000 Tasmanian pademelons (*Thylogale billardierii)* (Branson, 2008). The over-abundance of wallabies has resulted in browsing impact to pastures and native vegetation.

Management of wallabies on the island increased in 2013 when Department of Primary Industries, Parks, Water and Environment (DPIPWE) employed a Wallaby Management Coordinator (WMC) to work with landholders to manage wallabies. Management is integrated, involving wallaby-proof fencing, shooting and landholder education. Management is aimed at reducing wallaby population densities to alleviate browsing pressure on agricultural and natural environments. Management outcome targets are improved agricultural production, and a reduction in density of wallabies on the island.

Since 1975 DPIPWE has conducted annual nocturnal spotlight surveys on mainland Tasmania, and since 2001 on King and Flinders Islands, primarily monitoring Bennetts wallabies, Tasmanian pademelons and Brushtail possum (*Trichosurus vulpecula*) (Game Services Tasmania and Wildlife Management Branch, 2018). One-hundred and nighty

routes across Tasmania are surveyed, of which ten are conducted on King Island (Game Services Tasmania and Wildlife Management Branch, 2018). Consistent surveys are conducted annually from a vehicle travelling at 20 km/h along existing roads (Game Services Tasmania and Wildlife Management Branch, 2018). Surveys give population trends, as an index of density, rather than an estimate of total population abundance (Game Services Tasmania and Wildlife Management Branch, 2018).

MATERIALS AND METHODS

Location

The King Island climate is moderate, with its maritime location reducing diurnal and seasonal fluctuations (Barnes et al., 2002). The Island has average summer maximum temperatures of 20°C and an average winter minimum of 8°C, reliable rainfall of up to 1 050 mm, an average of 215 rain days per year, and prevailing westerly and south-westerly winds (Department of Primary Industries, Parks, Water and Environment, 2012; Turner, 2005). Climatic conditions provide optimal conditions for the production of beef and dairy livestock.

Grazing of stock first occurred in 1855 to 1860, ceasing due to a native pea species (*Swansonia lassertifoloa*) causing blindness and madness to stock, but re-establishing for a short period in 1869 (Turner, 2005). Settlement increased by 1901, when grazing predominantly occurred on coastal dunes, and the island rapidly developed a reputation for producing healthy stock (Turner, 2005). The dairy industry progressed in the following years on reclaimed swamps, sandy marshes and forests, due to the deterioration of previously grazed coastal dunes (Turner, 2005).

As reported in 2012, 56% (61 800 ha) of King Island is utilised as dairy and beef pastoral land, 19.6% (21 600 ha) is shrubby pasture and 14% (16 300 ha) is closed forest (Department of Primary Industries, Parks, Water and Environment, 2012). In 2006 gross agricultural production was valued at $30.7 million, and today King Island has a strong reputation for producing quality beef and dairy products (Department of Primary Industries, Parks, Water and Environment, 2012). At 27.7% the agricultural industry supports the highest share of employment on the island by 13.8% (Australian Bureau of Statistics 2018a).

Post-European settlement agricultural practices such as clearing, and introduction of non-native grasses reduced and modified natural environments, including native grasslands

(Barnes et al., 2002). Larger areas of native grassland and remnant wet sclerophyll forests are protected in State Reserves (Barnes et al., 2002). Conserving natural habitat for native flora and fauna is important, as exotic grasses, herbs and forbs constitute a large area of the island offering low habitat quality (Turner, 2005).

Vegetation is low in diversity, with 25 broadly defined vegetation communities. Main vegetation types being forest, woodland, scrubs, grasslands, heathlands, wetlands and salt marsh (Barnes et al., 2002). Only 30% of remnant native vegetation remains, of which 8% occurrs in small remnants (Barnes et al., 2002; Turner, 2005). Fifty of the 468 native vascular plant species on the island are currently listed as threatened under State and Commonwealth legislation (Barnes et al., 2002). Soil fertility, drainage, exposure to marine influences, fire, and anthropogenic influences, i.e. clearing and stock grazing influence native vegetation growth and survival (Barnes et al., 2002).

Several thousand invertebrate species constitute the largest portion of fauna on the island (Turner, 2005). More than 140 aquatic macroinvertebrates (crayfish, insects, crabs and snails), and eight species of freshwater fish inhabit aquatic environments (Turner, 2005). Six frog species, three snake species, and six lizard species occur on the island (Turner, 2005). One-hundred and eighty-two species of birds (along with 11 introduced species) are either breeding residents, regular or irregular migrants or visitors (Turner, 2005). Fourteen terrestrial mammal species have been recorded since settlement, two of which were extinct by the early 2000s (Turner, 2005). The most predominant native mammals to survive and prosper from geographic isolation, and post-settlement clearing are Bennetts wallabies and Tasmanian pademelons (Turner, 2005).

Bennetts wallaby and Tasmanian pademelons

Bennetts wallaby also known as Grey kangaroo, and Tasmanian Pademelon, hereafter Pademelon, also known as Rufous wallaby are common throughout mainland Tasmania, and King and Flinders Islands. Both species are classified as partly protected under the *Wildlife (General) Regulations* 2010, and a Game Licence or Crop Protection Permit (CPP) is required to harvest them (Wildlife Management Branch, 2011). Bennetts are the predominant species of wallaby on King Island, as they inhabit most vegetation types, preferring drier bush areas with open understories, whereas Pademelons prefer wetter areas with dense undergrowth (Norton and Johannsohn, 2010). Bennetts are larger, weighing up to 20 kg and standing approximately 90 cm tall, compared to Pademelons weighing up to 12 kg and standing approximately 40 cm tall. Both species share similar

behavioural characteristics as predominantly solitary animals, but mobbing around shared feeding areas. Bennetts have a smaller home range of 100 ha compared to that of Pademelons at 150 ha. Pademelons travel up to 2 km at night to feed, whereas Bennetts have been shown to travel only 1.7 km. Despite travelling further Pademelons are timid and feed within 300 m of bush lines, whereas Bennetts feed up to 500 m from bush lines. Wallabies are nocturnal animals, commonly feeding at dawn and dusk, browsing on grass, herbs and shrubs (Wildlife Management Branch, 2011). Both species have adapted to introduced grasses, legumes, and crop species. The palatability of introduced farmland pasture and crops species has influenced plant survival and growth due to browsing pressure (Norton and Johannsohn, 2010). Further, wallaby browsing can decrease stocking rates, as 2.8 Bennetts or 5 Pademelons will eat the equivalent of a 50 kg sheep (Norton et al., 2010).

Table 1. Biology of Bennetts wallabies and Tasmanian pademelons

Bennetts wallaby (*Marcopus rufogriseus*)	**Tasmanian pademelons** (*Thylogale billardierii*)
Height: 90 cm	**Height:** 40 cm
Weight: 20 kg	**Weight:** 12 kg
Description: Thick dark grey fur above and paler below. Reddish-brown neck.	**Description:** Underbody fur dark brown to grey-brown. Underbody yellow-brown.
Habits: Shelters in dense understory vegetation during the day. Forages on grasses, herbs and shrubs at night.	**Habits:** Shelters in dense understory vegetation during the day. Forages on grasses, herbs and shrubs at night.
Habitat: Pastures and grasslands with nearby forest, woodland scrub and heath with sparse understory vegetation	**Habitat:** Pastures and regenerating cleared land with nearby forest, woodland, scrub and heath with dense understory vegetation.

Wallaby management

Historically management of wallabies on King Island encompassed shooting, wallaby-proof fencing, vegetation clearing, commercial harvesting, and 1080 poison baiting (Norton and Johannsohn, 2010). The use of 1080 poison ceased in 2005 as a result of concerns that its use potentially compromised the image of the King Island export brand (Norton and Johannsohn, 2010).

A wallaby management program was established on King Island in 2013 with the aim of developing a long-term strategy to manage high population densities as few properties actively managed wallabies. The program aimed to reduce browsing damage impacting agricultural industries, and the repercussions to the local economy. The management program encompassed developing a management strategy to reduce abundance to a sustainable level, developing efficient and acceptable control measures (i.e. shooting, fencing), educating landholders and shooters on shooting techniques, and engaging with stakeholders and the local community.

The management of wallabies on King Island uses an integrated approach combining wallaby-proof fencing, shooting and neighbour co-operation. Wallaby-proof fencing is used across King Island and mainland Tasmania, however, when used on the Island this management tool comes at a greater financial expenses, due to shipping costs, and labour. Currently 240 km of wallaby-proof fencing has been installed across 21 properties on the Island. It remains recommended that strategic wallaby-proof fencing be installed in areas identified as high agricultural priority adjacent to large areas of native vegetation, and in cooperation with neighbours.

Shooting has historically been undertaken by landholders, and commercial and recreational shooters to manage wallaby populations. The WMC continues to educate landholders and shooters on best practice shooting and spotlighting techniques to improve efficiency. Eighteen landholders across 31 properties engage commercial shooters, paying the shooter $3 per wallaby killed. Wallabies are harvested recreationally under a Wallaby Licence (landholders exempt) during day light hours, or under Crop Protection Permits (CPPs) issued to landholders (and shooters) for use during prohibited hours (i.e. spotlighting).

Wallaby population monitoring

Wallaby populations on the island are monitored with annual spotlight surveys, conducted on ten roads by DPIPWE staff (Game Services Tasmania and Wildlife Management Branch, 2018). Surveys provide an index of density to monitor population trends, and are not intended to estimate population size (Game Services Tasmania and Wildlife Management Branch, 2018). It is important to note that wallaby management (i.e. shooting) is not targeted to roadside verge environments were spotlight surveys are conducted, and survey results may not be an inclusive indicator of management outcomes.

Spotlight survey results may over estimate wallaby population density trends due to the limitations of the method not surveying on private properties. Despite the limitations to this method, results present trends in wallaby population density.

RESULTS

Spotlight surveys 2010 – 2017

Since 2010 regional densities of Bennetts wallabies on King Island remained higher than the state-wide average. Pademelon populations have remained below the state-wide average for all eight years of the surveys (Figure 1).

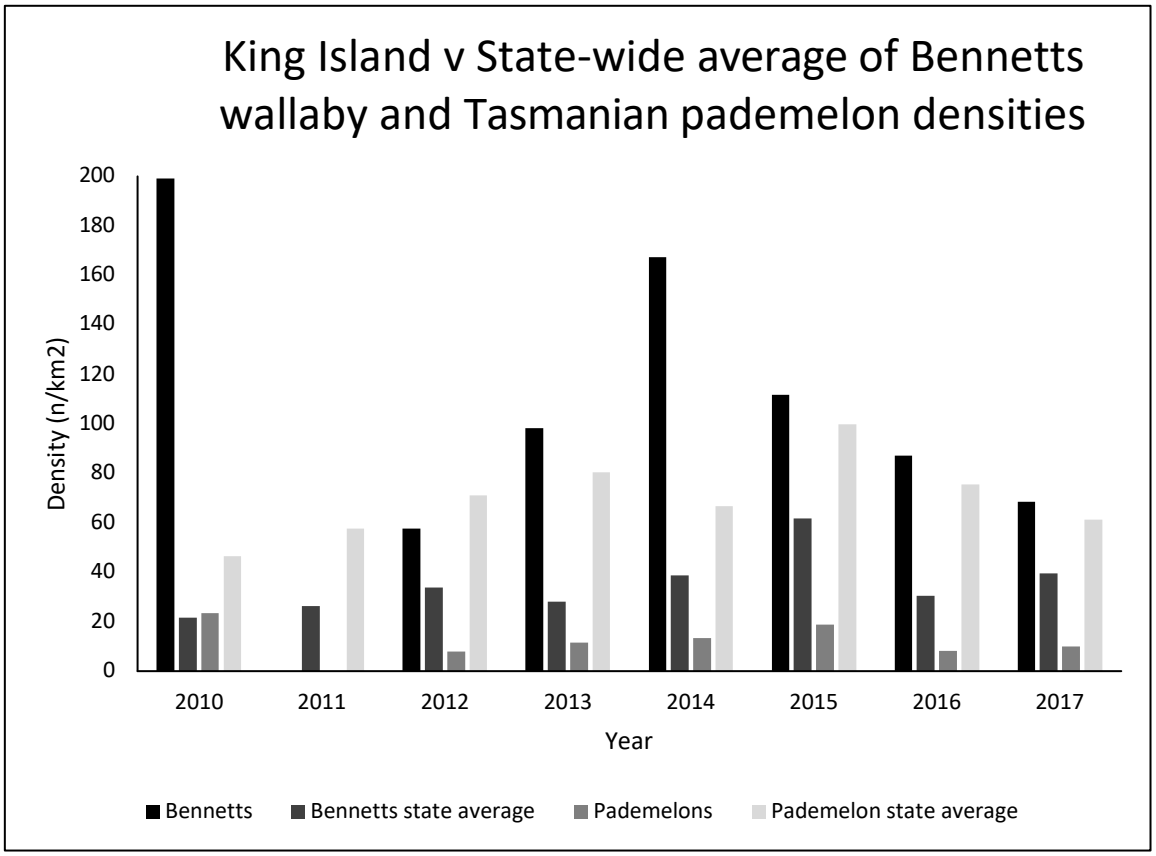

Figure 1. The density (n/km^2) of Bennetts wallabies and Tasmanian pademelons on King Island, compared to state average densities. Bennetts densities remain above the state average. Pademelon densities on King Island have remained below state averages. Densities of both species on King Island have decreased since 2010. *Note no surveys were conducted on King Island in 2011

Bennetts populations occur at a greater density than Pademelons. Both species have decreased in density since 2010 (figure 1). Densities of Bennetts have decreased 65.6%

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from 199.2 per km^2 in 2010 to 68.6 per km^2 in 2017. Pademelon densities have decreased at a lesser rate of 57.4% from 23.5 per km^2 in 2010, to 10 per km^2 in 2017 (figure 1).

Wallaby management

The number of current CPPs increased 1900% from four in 2013 to 80 in 2018 (figure 2).

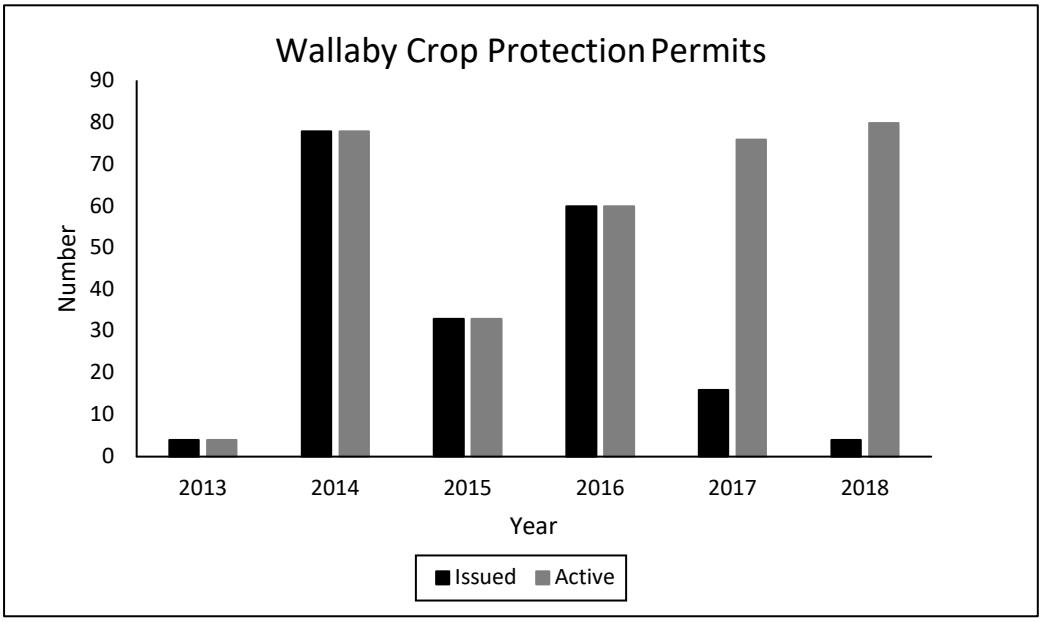

Figure 2. The number of current Crop Protection Permits issued to King Island landholders for Bennetts wallabies and Tasmanian pademelons. The current permits increased greatly from a low of four in 2013 to 80 in 2018. *Important to note CPPs were issued for 12 month period until 2016, when they were issued for a five year period.

Wallaby harvest peaked in 2013/2014 at 84 178 and 82 215 in 2014/2015. Over three years harvest decreased 36.4% to a low of 53 512 in 2017/2018 at 53 512 (figure 3).

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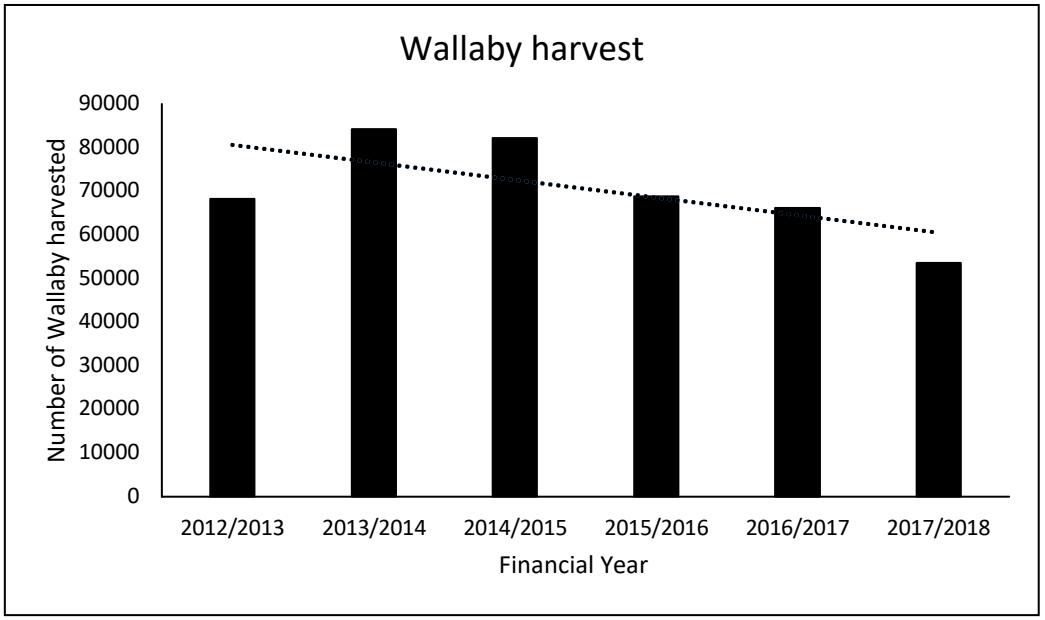

Figure 3. Number of wallabies harvested per financial year from the beginning of the employment of the King Island Wallaby Management Coordinator and active management of the two species in 2013/2014. A peak of wallabies harvested in 2013/2014 began to decline in following years, suggesting population levels were decreasing, therefore there were less animals to harvest.

DISCUSSION

Wallaby population densities

The success of wallaby management is reflected in the trend of their decreasing population densities. Bennetts population densities remained above the state average since 2010, at 818% above average in 2010 and decreasing to 73.2% above state average in 2017. Pre-management Bennetts population density was 65% greater than in 2017. It is evident that Pademelon population densities have remained below the state average for the eight years of surveying.

Wallaby Management

The number of active CPPs at the beginning of the employment of the WMC was four, and has increased to 80 in 2018. The increase in CPPs is an indicator of successful landholder education and cooperation.

Harvest numbers have declined by 36%, reflective of the decreasing trend in population density, as there are less wallabies available to harvest. The results of active management are reflective in the reduction in animals harvested, the decline in population density, and

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in reports by landholders acknowledging an increase in pasture and herd production, supporting population density trends.

The increase in active CPPs and a reduction in harvest numbers indicates that management practices are successful. As a result landholders, and small communities are reaping the rewards of a reduction in wallaby populations, as demonstrated in the following examples.

Grassy Township

The small township located on the islands South-east coast is surrounded by ideal wallaby habitat of woodlands, and cattle grazing pastures. Wallaby populations created many issues within the town such as faecal contamination of public areas, road kill, browsing impacts to parklands and backyards, and a loss of pasture production. More than 500 wallaby were culled from the township in 2014. It was reported that the culling activity left citizens feeling refreshed, and impressed with the 'outstanding results' (King Island Courier 2014a).

'Longford'

A cattle grazing property on the island's East-coast has an ongoing wallaby management program combining wallaby-proof fencing, shooting and grazing management. An article in the *King Island Courier* explained it as the best example of wallaby management leading to an increase in stock production (King Island Courier 2014b). In the first year of management 5 000 wallaby were shot, since then approximately 1 500 wallaby are shot annually. Within three years of implementing the program there has been a reported pasture production increase of 75%, allowing stocking numbers to increase from 650 to 1 150 head (King Island Courier 2014b).

'Eldorado'

When this property, located inland in the South-west of King Island was purchased there was minimal vegetation ground cover, or young trees and shrubs, and many mature trees were fallen due to ringbarking by wallabies (Strickland 2015 pers. comm.). Wallaby management began with periodic shooting, and wallaby-proof fencing. Since implementing management there has been a noticeable difference in the property's vegetation. Initially there was a regeneration of dense undergrowth of bracken, small herbs and ground cover vegetation, followed by establishment of seedlings of various species (Strickland 2015 pers. comm.). With the regeneration of the natural vegetation a positive

difference in bird life presence has been recognised. Wallaby populations have declined with the implementation of shooting and fencing, resulting in the regeneration of natural vegetation (Strickland 2015 pers. comm.).

'Wongi'

Located in South-western King Island Wongi is a beef breeding and finishing company, with a target of increasing stocking rates, and suppling MSA graded beef for the King Island beef brand (Cooke 2018 pers. comm.). Wallaby management was implemented 15 years ago due to the new seeding paddocks, neighbouring bushland, and the lack of grass establishment. The vegetation of the coastal hills surrounding Wongi provided good wallaby habitat. Grass and pasture neighbouring these habitats were minimal causing soil erosion, and wallaby tracks were a clear indicator of the source of the browsing pressure. Shelter belts were fenced off with electric fences to alleviate browsing of bark and regrowth of native trees and shrubs. Wallaby control progressed by undertaking 1080 poisoning. Results were effective and within a couple of weeks regrowth of pasture was evident. The use of 1080 become political, and it was decided it would no longer be used on the island. Wallaby fencing was installed on the eastern boundary, and the northern boundary was already fenced. Fencing was reasonably effective, but effectiveness was reduced due to the lack of neighbour cooperation. Wongi was the first property on the island to pay a shooter, $3 per wallaby, and at the time fellow landholders could not grasp the concept. Today contract shooting is a full-time operational and profitable business on the island. In the first year shooting was conducted paddock by paddock requiring no, or little movement, shooting 50-60 wallaby from one spot. In excess of 28 000 wallabies were culled from the property. The population structure has shifted to a younger and fatter and population. Populations are still high, but not the high concentration of numbers that existed pre-management. Shelter belts are beginning to recover. Stocking rates have increased with an increase in pastures. Wongi's management program is on-going. Fencing is effective, but not without its limitations, it is expensive and requires neighbour cooperation, further some landscapes are not suitable for fencing such as the coastal hills. Shooting is an effective tool, especially with neighbour cooperation. There is a commercial market for wallaby on the island, assisting in engaging commercial shooters (Cooke 2018 pers. comm.). Wongi is an example of a property that has long standing wallaby management that have controlled wallaby populations on their pastoral grazing land through shooting, fencing and neighbour cooperation.

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King Island Cattle Company

King Island Cattle Company endure challenges out of their control such as annual rainfall, soil temperature and wind, all effecting pasture growth. Pest control is another challenge requiring management, and along with fertiliser and chemicals for weed control culling of wallabies is considered an expense of running a farm on King Island (Cooper pers. comm.). Properties neighbour extensive areas of dense bush on Crown Land, and paddocks are exposed to large numbers of browsing wallabies. Livestock compete with wallabies for pasture and shelter. A wallaby management program began in late 2016 aiming to increase Dry Matter kg/ha. Observations of pasture has identified that wallaby culling has resulted in an increase in growth and production, successfully increasing DM kg/ha (Cooper pers. comm.). Pasture growth has allowed for extended cattle grazing periods, and growth and development of reseeded pasture. The numbers of wallabies culled has decreased from 1 600 in one month (2016) to 175 a month (2017 and 2018) (Cooper pers. comm.). As part of an integrated wallaby management plan (and now that wallaby numbers have been reduced) wallaby-proof fencing will be installed encompassing the entire property boundary. In a short time period of wallaby management using only shooting, populations have decreased, decreasing pressure allowing for fencing to be installed, and pastures to recover.

CONCLUSION

King Island is well known for its pristine environments, and high quality beef and dairy products. Over-abundance of Bennetts wallabies and Tasmanian pademelons populations negatively impact both the natural and agricultural environments. From a conservation perspective it is important to ensure there is suitable biodiversity within the available habitats for the many native flora and fauna species inhabiting the island. Further, it is important to ensure the security and financial return of the agricultural industry on the island.

It is evident that King Island landholders have overcome adverse browsing pressure of Bennetts wallabies and Pademelons through effective management controls. Cooperation between neighbours in shooting and fencing programs has led to positive outcomes. Survey reports suggest trends of decline in wallaby densities since the WMC was

employed. Landholders that have been practicing management in the long- and short-term have experienced recovery of their pastures with the alleviated wildlife browsing pressure. A reduction in wallaby browsing pressure has allowed for increases in stock herds, and longer periods of grazing.

The future of wallaby management will continue under guidance from the WMC, with the continual promotion of integrated management and neighbour cooperation. Education is vital in the management process and remains a priority. It is evident from survey results that another Tasmanian island, Flinders Island is experiencing high densities of wallabies, and given the success of the management programs on King Island the same model has potential for use on Flinders Island. King Island landholders will continue to cooperate with shooting and fencing to manage wallaby populations, to ensure future security and profitability of their valuable industry.

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