MANAGING WILD DOGS AT HUNCHY: PEST, PARTNERSHIP, AND PEOPLE POWER

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ABSTRACT

Invasive species threaten human and animal welfare, environment, community, and industry. The locality of Hunchy on the Sunshine Coast has a history of wild dog impacts. This project critically assessed if an integrated long-term pest management program could be effective in reducing wild dog activity at both a localised and landscape level. The Hunchy Wild dog project was a perfect example of pest, partnership, and people power. Through a collaboration with four private landholders and council, the Hunchy wild dog project on the Sunshine Coast ran from 2018-2021. The management of wild dogs included the use of canid pest ejectors, soft catch foothold traps, and field shooting. Cameras were used to monitor for changes in wild dog and prey species activity. This project demonstrates how participating properties, native wildlife, livestock, and the wider community can benefit from long term integrated pest management programs. It also demonstrates the importance to conduct long-term monitoring to evaluate the progress and adapt to changing circumstances. The outcomes of this program can help inform future pest management approaches to peri-urban wild dogs by local governments and the community in similar environments but also highlight the potential downfall if robust management programs are not maintained or monitored. Effective management programs require collaboration, people power and long term continued commitment. A one-off response to any pest management issue will not make lasting impacts on environment, industry, or community.

Keywords: Wild dog, Sunshine Coast, Community, Environment, Industry, Collaboration

INTRODUCTION

Wild dogs (Canis familiaris) and European Red Foxes (Vulpes vulpes) can invade peri-urban areas including school grounds, parklands, and suburban backyards. With densely populated urban areas increasing, the potential for human-wild dog interactions also increases. Wild dogs are considered one of largest vertebrate threats in Australia (Jackson et al., 2017), with predation threatening both native species, including local populations of koalas in peri-urban environments and livestock (Please et al., 2018; Allen et al., 2016). Furthermore, wild dogs' impact the community in other ways including maiming and killing domestic pets, threatening people, transmission of disease and stock harassment.

An effective management program for wild dogs needs to be intensive, continuous, and applied across different tenures (Howard 2019; Kreplins et al., 2018). There are many challenges in implementing an integrated coordinated management program such as understanding the target species ecology (Martin et al., 2019), cost of ongoing control, community perceptions on animal rights and pest species, social equity, and environmental sustainability (Howard, 2019). In Australia, wild dogs and their impacts have been widely managed utilising one or a combination of the following best practice controls: baiting, trapping, fencing, shooting and utilising guardian animals.

The Canid pest ejector (CPE) has been proven to effectively deliver toxins to wild canid species in Australia. CPEs consist of a housing that is driven into the ground, a spring-loaded piston and trigger, a poison capsule, and a lure head (Kreplins et al., 2018). When the lure head is pulled upwards, the trigger hits the piston and the capsules' contents is ejected into the animals' mouth. As the CPE housings are driven into the ground this reduces the risk of bait caching or translocation. The design of the ejector also reduces the risk to non-target species as it requires a minimum 1.6-kilogram vertical pull which limits the number of species capable of this action (ACTA, n.d.). Sodium fluoroacetate (compound 1080) has been the principal toxin used in the control of many invasive species in Australia. Native animals including mammals, birds and reptile species have developed a tolerance to sodium fluoroacetate over time having evolved alongside with native Australian plant species, from which it was formed.

Councils can assist in initiating management programs on properties impacted by invasive species. Upon request by a landholder, Sunshine Coast Council officers will respond using a strategy depending on a variety of factors: proximity to a town, proximity to neighbours, has free roaming animals either livestock or domestic pets and the frequency of invasive species presence. On the Sunshine Coast, Council officers will turn to three available management tools to assist landholders, 1) canid pest ejectors, 2) soft-jawed foothold traps or 3) cage traps. Based on the factors above, officers will determine the suitability of control.

This project aims to assess the effectiveness of wild dog management activities coordinated by Sunshine Coast Council in the Hunchy district of the Sunshine Coast, south-east Queensland. This area has a history of known wild dog impacts, and measures undertaken to manage wild dogs, and is thus considered a suitable area for assessment. The project will critically assess if the integrated pest management program conducted has been effective in reducing wild dog activity, at the localised level and an overall landscape level. The outcomes from the project will help to inform optimal pest management approaches to peri-urban wild dogs by local governments and the community in similar peri-urban environments.

METHODOLOGY

Hunchy Project Area Methodology

Geographical description

The locality of Hunchy and surrounding suburbs has been historically impacted by wild dogs. This region has experienced increased urbanisation, evident through a general decrease of property sizes, which limits options for wild dog control. In addition, the topography can be inaccessible, further increasing barriers for control. In 2018, four larger landholders in the Hunchy area were approached by the Feral Animal Education and Control team for collaboration of a joint coordinated integrated management program. These four private properties (Property A: 11Ha; Property B: 65Ha; Property C: 24 Ha; Property D: 16 Ha) are situated at the foothills of the Blackall Range, Sunshine Coast, Queensland. Properties A, B and C are all adjoining with Property D separated by approximately 1km. Properties A, B and D all are currently running breeding cattle and all experienced impacts from wild dogs. Property C despite not having stock, upholds good neighbour morals and observed impacts on wildlife. Due to proximity of these properties to one another and the home ranges of wild dogs, individual properties were not considered independent from each other. Thus, all data collected was pooled for analysis.

Camera monitoring

Monitoring cameras were installed on all four properties before and during the management program. Each property had two Scout guard® SG560K-18mHD motion detection cameras for the entire duration of the program 2018-2021. The two cameras were placed between 120-1055m apart (an average of 395m). Cameras were set along tracks likely to be visited by wild dogs to increase chance of target captures.

Each camera is motion sensored with infra-red capability and mounted horizontally on either a tree or fence post 0.3-1m above the ground and directed towards a track. The camera settings were set to record a burst of three images per event with a delay of one minute. The cameras used the same station locations (±15m) for the entirety of the survey period 2018-2021.

Canid Pest Ejector Deployment

A risk analysis was conducted prior to Canid Pest Ejector (CPE) installation to identify suitable locations for their deployment on the properties. This was done in conjunction with the regulatory distance restrictions and a Sunshine Coast Council risk assessment.
CPEs were installed and maintained by council officers. Under Sunshine Coast Council policy, CPEs are checked and serviced at least every four weeks. Several types of lures were used in conjunction with CPEs to increase visitation and elicit a response leading to activation by wild dogs. Canid Pest Ejectors were deployed with 6mg of sodium fluoroacetate (compound 1080) capsules for wild dog control. CPEs were placed no closer than 60m apart, along tracks with high wild dog activity, identified by monitoring cameras placed several months prior to CPE installation. CPEs were placed as close to a monitoring camera as possible.

Trapping

Soft-jawed foot hold trapping was conducted in areas that were deemed to have high invasive species presence, minimal risk to domestic pets (including neighbouring pets) and preferably without the presence of livestock. Livestock, whilst unharmed by trapping often set off traps making it a labour-intensive control method for officers. Telemetry cameras, motion-sensor activated cameras that send photos to a designated phone number via MMS were utilised to monitor traps throughout this project. Telemetry cameras were used to ensure animal welfare is not compromised therefore phone reception becomes a requirement. The traps were serviced on average every 2 weeks, depending on frequency of invasive species presence, weather, telemetry camera battery life and the result of any captures requiring attendance. As part of this project Victor-3 soft jawed foot-hold traps were installed. Trapping was undertaken during high impact periods to calves as well as in response to the presence of pups. Cage trapping is also used for wild dogs and foxes and are often provided to landholders that do not meet the requirements of the other two forms of control. Opportunistic cage trapping was conducted by landholders as a supplementary control method to the CPEs.

Field Shooting

Opportunistic field shooting by all properties were conducted by landholders as a supplementary control method to the CPEs. Control results by landholders by means of field shooting was recorded by SCC officers but dates of all efforts resulting in no control are unavailable.

Localised Integrated Management 2016-2021

In addition to the control efforts in the Hunchy project area, foothold and cage trapping and use of CPEs were used in general areas surrounding Hunchy as an extension of the integrated management program.

Community Reporting

Council receives requests for assistance by landholders that are experiencing impacts by invasive species. Every request is recorded in the council database. These records (de-identified-for privacy reasons) were collated as a measure of wild dog impacts on the community. These requests for assistance can be monitored over time, by locality and by individual pest species.

Statistical Analysis

Images were manually assessed for the presence of all animals of interest. Each observation of the following taxa was added into a Microsoft Excel spreadsheet: wild dog, fox, cat (*Felis catus),* European hare (*Lepus europaeus),* large macropod, small macropod, small mammal, Australian brush turkey (*Alectura lathami*), small bird and reptile. An animal event was classified as the number of specific species in a shot over burst of three photos (i.e., each set of bursts of three was classified as a separate event). For example, if one dog was seen in each shot over burst of three images this was considered one dog event. If two dogs were identified in the first of three bursts but only a single dog in following two shots, then it was considered as two dog events. If an animal happened to still be in front of camera in the second burst of three shots it was classified as a second separate event. The events data were then tabulated based on date in Microsoft excel. The data was then collated by month and the Passive Activity Index (PAI) was calculated monthly (Bengsen et al., 2011). The Passive Activity Index is based on a simple count of the number of times an animal crosses a series of plots or a camera over a known number of days (Allen et al., 2016; Bengsen et al., 2011).

Here, data is collected from the cameras over consecutive days, the events are tabulated daily then from here and overall mean was calculated for the month.

$$PAI\ utilised = \frac{The\ sum\ of\ events\ for\ that\ species\ for\ the\ month}{The\ sum\ of\ operational\ camera\ nights\ in\ the\ month} \text{ x } 100$$

This was then replicated for each of the eight cameras then averaged across all eight cameras for the period of 2018-2021.

Seasonal PAI was calculated using the below method to determine if there were difference in wild dog activity throughout the year.

$$PAI\ utilised = \frac{The\ sum\ of\ events\ for\ that\ species\ for\ the\ season}{The\ sum\ of\ operational\ camera\ nights\ in\ the\ season} \text{ x } 100$$

A linear model with a log transformation and analysis of variance (ANOVA) was used via the statistical program R. The ANOVA was used to confirm if a significance existed of the year or season in the model. The residuals and normality were visually checked which suggested a log transformation was most appropriate.

Community Request

The aim of this analysis was to determine if requests decreased over time (year to year) or if more (or less) requests were received in a particular season. The community request data was compiled from the council database, categorised to show the number of wild dog and fox requests per month between 2016-2020 (2021 was not a full complete year and was not included). Where no complaint was recorded for a particular month (per year) it was assigned the value 0. The number of requests by year and by season were compared. Both wild dog and fox species were included for comparison. A Generalised Liner Model (GLM) with a Poisson distribution (family) was used via the statistical program R.

RESULTS

Hunchy Project Area Results

Table 1 shows the results gathered for the Hunchy project area from the four participating properties including: Canid pest ejector, foot hold trapping, cage trapping, field shooting and the analysed camera monitoring data. Table 1 displays the results gathered as part of the project from 15 May 2018 till 12 February 2021. The ten CPE activations in Table 1 lead to the removal of wild dogs. foxes accounted for eight of the CPE activations. Foothold trapping saw the removal of two wild dogs and one fox from the West Woombye property. Table 1 also shows landholders removed five wild dogs from their properties.

Canid Pest Ejectors, Trapping, Field Shooting

Table 1. Hunchy Project area control results for period of 2018-2021

Species	Date Activated	Locality	Control
Wild Dog	15/05/2018	Hunchy	CPE Activation
Wild Dog	15/05/2018	West Woombye	CPE Activation
Wild Dog	3/07/2018	West Woombye	CPE Activation
Wild Dog	17/08/2018	West Woombye	CPE Activation
Wild Dog	20/08/2018	West Woombye	CPE Activation
Wild Dog (J)	24/08/2018	West Woombye	Trap
Fox	17/09/2018	Hunchy	CPE Activation
Wild Dog (M)	29/09/2018	West Woombye	Field Shot
Wild Dog (F)	29/09/2018	West Woombye	Field Shot
Wild Dog (J)	5/10/2018	West Woombye	Trap
Fox (M)	10/12/2018	West Woombye	Trap
Wild Dog	26/02/2019	Hunchy	CPE Activation
Wild Dog	23/04/2019	Hunchy	CPE Activation
Wild Dog (F)	23/04/2019	Hunchy	Field Shot
Wild Dog (J)	15/02/2020	Hunchy	Field Shot
Wild Dog (F)	18/03/2020	Hunchy	Field Shot
Fox	3/06/2020	Hunchy	CPE Activation
Wild Dog	26/06/2020	Hunchy	CPE Activation
Fox	26/06/2020	Hunchy	CPE Activation
Fox	16/07/2020	Hunchy	CPE Activation
Fox	21/08/2020	West Woombye	CPE Activation
Fox	21/08/2020	Hunchy	CPE Activation
Fox	18/09/2020	Hunchy	CPE Activation
Wild Dog	18/09/2020	West Woombye	CPE Activation
Wild Dog	26/09/2020	Hunchy	CPE Activation
Fox	13/11/2020	West Woombye	CPE Activation

J; Juvenile, F; Female, M; Male

Overall, the management program removed seventeen wild dogs and nine foxes between 15 May 2018 and 12 February 2021. Most (55 %) were from within the Hunchy locality, with the remainder from the nearby West Woombye locality.

Statistical Analysis

Figure 2 was compiled utilising Passive Activity Index in conjunction with an ANOVA. The PAI data included monitoring data from 2018-2021. The Passive Activity of wild dogs decreases over time (p= 0.04386) significantly from 2018 to 2020 (p = 0.0145) and 2018 to 2021 (p =0.0294). In comparison to Passive Activity between seasons which were not statistically significant (p > 0.05= 0.25297).

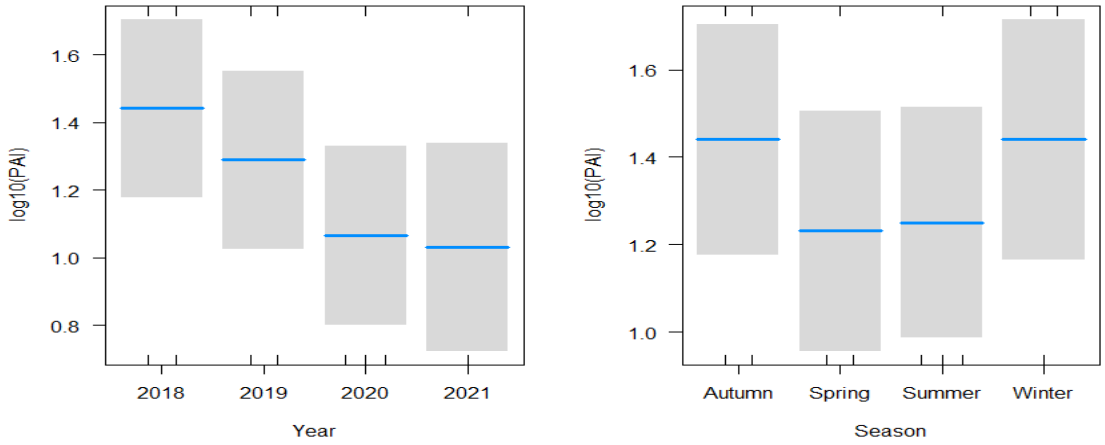

Figure 1. Box Plots displaying (left) decreasing trend in wild dog PAI 2018-2021, and (right) but no difference in wild dog PAI across differing seasons.

Community requests

The following data was compiled from the council data base of community requests for assistance for wild dogs and foxes from 2016-2021. The customer requests (CR) for wild dogs decreases across the years from 2016 till 2021 (Table 2). In comparison the number of wild dogs and foxes removed from the region across the years do not appear to have a pattern. Table 2 also shows the amount of CRs and results for foxes from 2016-2021. The total number of fox and wild dog CR combined is tabulated in Table 2 along with results.

Table 2. Comparison of customer requests and results from 2016-2021 from Hunchy and surrounds.

	2016	2017	2018	2019	2020	2021		Aft 2021	2022	2023
CR Wild Dogs	23	23	18	13	9	3		3	20	19
Results Wild dogs	0	9	22	6	8	0		1	4	6
CR Foxes	12	19	11	14	4	7		9	16	7
Results Foxes	2	4	3	4	10	2		1	5	3
Total CRs	**35**	**42**	**29**	**27**	**13**	**10**		**12**	**36**	**22**
Total results	**2**	**13**	**25**	**10**	**18**	**2**		**2**	**9**	**9**

CR; Customer requests for assistance. After 2021; after the project concluded in 2021

The analysis suggests that there was an observed decreasing trend in community requests for assistance with wild dogs and / or foxes from 2016-2020. The analysis showed a statistically significant decrease in 2020 compared to 2016 (p <0.001= 0.000502). Whilst the other years were not significantly different there appears to be a decreasing trend over this

time period. Seasonally, there was no difference in requests received ($p > 0.05$). There was no difference found comparing requests received for wild dogs versus fox therefore these were combined.

Data from 2021, 2022 and 2023 was included after this analysis was conducted. It has been included for the purpose of demonstrating importance of partnerships and people power.

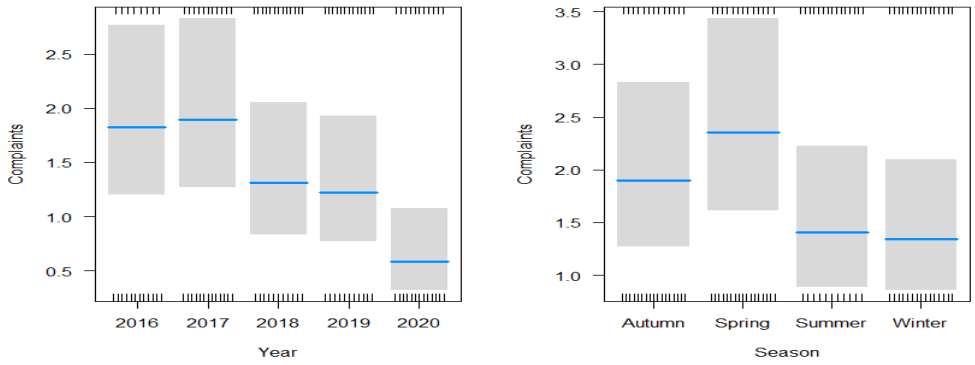

Figure 2. Box Plots showing (left) decreasing trend in community requests 2016-2020 and (right) no difference in community requests across differing seasons.

DISCUSSION

This integrated management program utilised CPEs, foothold trapping, cage trapping and field shooting to effectively remove several invasive species from the four participating properties. The removal of these animals not only had a beneficial impact on the four participating properties but a flow on effect to the wider area. The evaluation of the program's effectiveness was undertaken through monitoring cameras and requests for assistance to council. Both showed declines in wild dog activity and a reduction in community requests (see Table 2). These findings are supportive of this management program and discussed in more detail below.

Passive Activity Index was applied to the camera trapping survey data to generate activity indices from photo observations of wild dogs at repeated survey sites over a continuous period. Other studies that have utilised cameras to monitor animal populations concluded that changes in capture frequencies was an indicator in changes in population abundance as capture frequencies strongly correlated with activity indices that were independently calculated (Kawanishi & Sunquist, 2004). As with other studies it was found that passive activity index models can be easily applied to wildlife management programs in conjunction with the use of camera traps without the need to change sampling protocols (Bengsen et al., 2011). This project also verified that analytical analysis can be coupled with passive activity indexes to provide a useful tool for following statistically significant changes in wildlife abundance (Bengsen et al., 2011).

There was an observed decreasing trend of wild dog activity from 2018 to 2021. and no difference found seasonally for either wild dog PAI nor in community requests for assistance. Which is a curious result as it has been widely published that wild dog activity is generally influenced by season (McNeil et al., 2016). As seasonal variability was not considered to be statistically significant in the case of wild dog activity it suggests that the integrated management program was effective for the management of wild dogs. Anecdotally, once the identified original wild dog pack (all but one) was removed from the area, immigration of new individuals was observed. This is a common occurrence when animals are removed

from an area, with neighbouring individuals moving in to assume occupancy in an effort to the take advantage of vacant territory and available resources within (Efford et al., 2000). As predators (wild dogs and foxes) were continuously removed from the area over the program period, increases in native species abundance were observed. The Passive Activity Index of small macropods, brush turkey, small birds and reptiles over time all show an increasing trend. This suggests that integrated pest management programs have had a beneficial effect on native species.

An effective integrated management plan needs to be continuous and strive for nil-tenure (Howard, 2019; Martin et al., 2019). Community involvement and nil-tenure approach to pest management programs are heavily dependent on trust, interpersonal relationships, reciprocity, shared purpose (e.g., protect livestock) and in most cases a conduit person to assist networking, communication and encourage community led actions (Howard et al. 2018). Limitations to community involvement include cost, understanding target species ecology, lack of resources and skills, attitudes towards government and preference of non-lethal methods (Please et al. 2018; Howard, 2019). Other studies have found that when a community integrated pest management program is supported by local government the community comes together, and better outcomes are achieved (Howard et al., 2018). This program may have only included four properties but the whole community was aware and supportive of this program. This program has seen a decrease in the number of requests for assistance from the public following wild dog control measures. This supports the claim that integrated wild dog control can reduce the impacts of wild dogs on the community over time.

As with any ‘in the field’ program there were limitations to this study. First limitation of this project was the absence of non-treatment sites in which a comparison could have been made. This does not allow for a comparison of data from the treatment area to a site without integrated control. Secondly, access to the properties was sometimes hampered by wet weather. During these times CPEs were serviced a week later than scheduled and required servicing on foot. Wet weather also influenced the operation of the CPEs. Some actuators were found seized and inoperable. Cattle and brush turkeys on the properties lead to false activations. Cattle also caused soil erosion impacting the ability of CPEs to fire as soil built up around the trigger mechanism. Cattle also made it difficult to provide other options of control including trapping due to inquisitive behaviour and setting off traps constantly. The topography often determined control locations due to accessibility. Towards the end of the program, native birds (i.e., Torresian Crow- *Corvus orru*) had learnt to attack the sensor lenses on two of the cameras leading to potential camera data loss.

Despite the limitations, they are all real-world occurrences that can happen in any management program around the world. Some instances cannot be controlled and accounted for, unlike in laboratory conditions. In a controlled experiment one can control many variables such as the climate, off target species, and location. Under field conditions, conducting real applied science the above limitations were unable to be controlled. A larger scale replication of this project, with a non-treatment site for comparison, would help to verify conclusions and see if it can be duplicated. Implementing set pre-during-post control time frames may also be useful to see outcomes of integrated pest management programs more clearly.
Data collected from after this project demonstrates the importance the of continued integrated management of pests in the environment. It clearly shows how quickly impacts on the community can return. That people power and partnerships are just as important to a pest management program as the actual control methods and management of invasive species.

CONCLUSIONS

This project is an example of how participating properties, native wildlife, livestock, and the wider community can benefit from integrated pest management programs. It is important that integrated pest management programs conduct long-term monitoring as part of the process to enable evaluation of the progress and adapt to changing circumstances. This program will go on to assist future pest management approaches to peri-urban wild dogs by local governments and the community in similar peri-urban environments. To hopefully drive the importance to collaborative partnerships and people power and how it can make all the difference.

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