

This Standard Operating Procedure (SOP) is applicable to all USQ Research Workers who care for and use Animals for Scientific Purposes. The procedure must only be performed by those persons who have been deemed competent and who believe they remain competent to do so. Access to supervision by suitably qualified staff whilst undertaking this procedure is encouraged, where required.

Species

- *Vulpes Vulpes* (Red foxes)

Purpose

The purpose of this SOP is to provide information to people considering the use of the Mata Hari Judas female technique for detecting and control on wildlife, principally vertebrate species, an understanding about what a Vennel is, how it is used as part of the Mata Hari Judas technique and the process of constructing a Vennel.

The red fox, *Vulpes vulpes*, is an introduced predator, is a major economic problem through predation of livestock, e.g. chickens, lambs and kids (estimates of death from foxes in sheep and goat flocks range up to more than 30% of their lambs and kids) (Gentle 2006, Saunders et al. 2010). Foxes are also a significant threat to biodiversity as a predator, particularly of native species in the critical weight range between 35 and 5,500g (e.g. native mice and rats, most of the marsupial carnivores and many of the marsupial herbivores) and are a competitor to native species, particularly quolls.

Foxes have been strongly implicated in the extinction of a growing number of Australian species and are a recognised threat to many vulnerable species (Gentle 2006, Saunders et al. 2010). Baiting, shooting and trapping are regularly used to control foxes, although these methods are typically used to reduce the impact of foxes rather than eradicate them, and all have limitations. Baiting and trapping have inherent problems with by-catch, and shooting has been shown to be most effective when fox numbers are high. None of the traditional control methods is considered 100% effective, and therefore ongoing management of foxes is always necessary.

One technique used to successfully eradicate other vertebrate pests, as yet untested in foxes, is the Mata Hari Judas technique (Cruz et al. 2009). This is a technique where a female (in this case, vixen) of the target species is hormonally induced into prolonged oestrus to attract animals of the same species. The Mata Hari Judas technique was first developed 15 years ago as part of the PhD project by Dr Karl Campbell (Campbell 2007; Campbell et al. 1. 2007), and the process of prolonging oestrus for the same purposes (detection for control of invasive species) has been demonstrated in cats (Murray et al. 2020) and dogs (N.Fraser, unpublished data as a part of er PhD). All of these studies used Compudose-100 to induce prolonged oestrus. For these species, the duration of the prolonged oestrus has been 128 days for goats, 27 days for queens and 57 days in bitches. For both queens and bitches, both entire and ovariectomised females were attractive to males of the same species. Additionally, both males and females of the species have been attracted to the MHJ female. If we can collect the 'smell' and vocalisations from a vixen in oestrus and demonstrate that they are as effective as the live vixen in oestrus to attract and therefore detect other foxes, then we overcome the welfare issues of using live animals.

To be able to protect a wild female animal in prolonged oestrus (from predators, rain, sunlight) and test her attractiveness to members of the same species, MHJ female needs to be *in situ* in the wild such that members of her species can find her. The Vennel is a relatively larger, moveable self-contained (e.g. nest box, with food and water) structure designed to not only protect the MHJ vixen but also trap members of the same species that attempt to access her (out of curiosity or desire to mate with her) and then keep those trapped animals safe from other members of the same species, while also recording by camera visitation to the Vennel by animals that may not get caught.

Definitions

MHJ	Mata Hari Judas
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Linked SOPs

SOP ID number	SOP title
WL013	Development of the Mata Hari Judas female

Potential Hazard to Research Workers

USQ Risk Management Plan ID number	USQ Risk Management Plan title
RMP_2020_4960	Wildlife research and teaching fieldwork

Personal Protective Equipment required

- Field appropriate clothing (long sleeve shirt, long pants, gloves, hat, etc.)
- Eye protection
- Enclosed footwear – boots
- Gardening gloves

Animal wellbeing considerations

Perceived stressors	Management strategy
Poor appetite, lack of offered food eaten	Feed good quality dried dog food and monitor feed and water intake and faecal output to determine if the diet is eaten and if any digestive problems occur (indications include diarrhea, vomiting). Change diet if necessary, repeat process.
Extreme escape behaviours	Increase amount of cover in holding pen, e.g. put more hollow logs, more 30cm PVC piper into holding pen and monitor vixen.
up to three weeks confinement	Foxes are normally solitary animals except during the breeding season and are kept in much smaller pens on their own in farming systems. However, while in confinement in the Vennel to alleviate the potential pain and distress from isolation and confinement, provide the vixens with enrichment (e.g. kongs) and place a plastic 'shell pool' sandpit containing beach sand for her in the bottom of the Vennel.
Severe weather risk	If a severe weather event is forecast during the time that the Mata Hari Judas vixens are in their Vennel they will be taken from the Vennel and transported to the Hidden Vale Wildlife Centre and held in the large (6x6m) enclosure until the severe weather event has passed and then returned to the Vennel.

The overall perceived level of risk to an animal undergoing this procedure is:

High
 Medium
 Low

Substances to be administered

Substance	Dose	Route	Purpose
Not applicable.			

Equipment/ materials required

- Vennels (1.5x1.5x1.8m), i.e. a self-contained 'kennel' with an automatic feeder, waterer and enrichment, internal nest box (40x40x40cm) and shelves (30cm wide and across the width of the Vennel) that protect

the animal inside from rain and sunlight and access from animals outside the Vennel (Figure 1). The Vennel has a double roof to reduce the heat from the sun inside the Vennel

- Vehicle and 6x4 trailer to transport Vennel and associated equipment
- Tool kit (i.e. range of screwdrivers, spanners, spare bolts, screws, pliers hammer)
- Roll of tie wire
- Hinges and associated bolts to attach PVC pipe traps to the Vennel (or other material to ensure PVC pipes can't be detached by the animal inside the pipe or by other animals outside the pipe)
- Automatic feeder (as used for cats and dogs)
- Automatic waterer (as used for cats and dogs)
- 4 x Tasmanian devil PVC pipe traps typically about 30cm in diameter about 90cm long required for each Vennel
- Feed and water supply for Vennel sufficient for the duration of the time animals are held (typically less than a month)
 - Jerry cans of freshwater
 - Bags of dry dog kibble
- Hessian bags and strong cardboard boxes (e.g. 30+cm width and height – big enough to fit and support a Tasmanian devil PVC pipe trap (to stop it rolling))
- Camera traps
 - Batteries
 - SD cards
- Star pickets
- GPS radio collars
- Monitoring sheets
- Gardening gloves
- Disposable examination gloves – various sizes



Figure 1: Inside view of prototype Vennel showing roof, ventilation mesh at the top of the wall, shelf and nest box, hole in the wall where the Tasmanian devil PVC pipe trap would be attached on the outside, and holes in the wooden floor for removal of faeces. This design has been modified, and the Vennel is bigger with an insulated overhanging roof and walls made from insulation panels used for cool rooms.



Figure 2: Tasmanian devil PVC pipe trap to be used for trapped foxes.

Site specification or location requirements

- Old Hidden Vale property, 617 Grandchester Mount Mort Rd, Grandchester 4340
- 579-583; 558-585 and 586-598 Middle road, Purga near Mutdapilly
- Spicers Peak Station, Wilkinson Road, Maryvale, Queensland

Procedure

1. Collect and transport all sections – four walls, roof panels, nest box, shelf, floor, four Tasmanian devil PVC pipe traps per Vennel, automatic feeder, automatic watered and construct Vennel in the desired location using tools in the tool kit.
2. Set up camera traps on and around the Vennel to observe visitation by animals to Vennel and MHJ vixen inside the Vennel.
3. An adult female fox (vixen) will be captured from the wild, using the best practise techniques for catching foxes as per national COPs and SOPs, including those for cages and soft-catch traps and then taken to Hidden Vale Wildlife Centre veterinary clinic using the appropriate SOP to implant her with the required dose of Compudose-100 and then place her into the Vennel.
4. Each morning go to the Vennel, check the vixen and remove animals from traps.
5. Release native animals or previously captured radio-collared foxes. If a new fox then take it to the Hidden Vale Wildlife Centre veterinary clinic, and the fox will be anaesthetised by an intramuscular injection of a combination of Tiletamine hydrochloride and zolazepam hydrochloride (Zoletil). The transmitter will be attached via a collar that will be fitted around the neck, secured to prevent it from slipping off easily, but without being too tight, it may cause pain or injury to the animal.
6. The radio-collared fox will then be transported back to the Vennel and released. The animal will be monitored (visually) as it is released by staff, who will observe the animal until it leaves their field of view.
7. When foxes are captured in the PVC pipe traps, these pipe traps containing trapped foxes will then be placed into a hessian bag to allow for easy transportation (in an airconditioned vehicle) to and from the Hidden Vale Wildlife Centre veterinary clinic. To stop the PVC pipe traps (containing foxes) from rolling, they will be placed in a cardboard box to stop the PVC pipe trap from rolling in the vehicle during transportation.

Vennel design

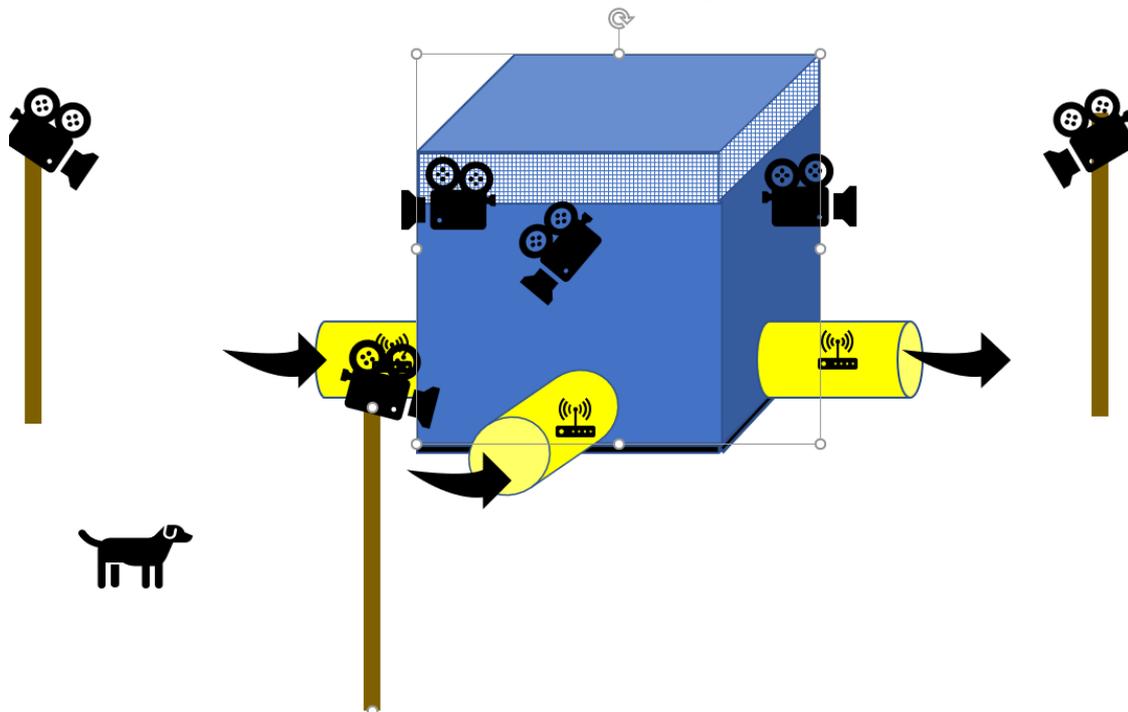


Figure 3: Vennel design showing Vennel in blue (with mesh at the top of walls), yellow Tasmanian devil pipe traps (three visible) with trap alerts (with antennae) and wildlife cameras recording animals near traps and approaching Vennel. NOTE: the roof will overhang the walls by about 30cm (not shown above), and the roof and parts of the walls be made from insulation panels to reduce the temperature inside the Vennel.

Training, qualifications or competencies required

Researchers with relevant experience or qualification can only undertake this SOP to complete the procedures required.

Student researchers must receive appropriate training and supervision from USQ research supervisors or qualified individuals prior to undertaking procedures.

References

- Campbell, K.J., Baxter, G.S., Murray, P.J., Coblenz, B.E., and Donlan, C.J. (2007). Development of a prolonged estrus effect for use in Judas goats. *Applied Animal Behaviour Science* 102, 12-23.
- Campbell, K. J. (2007). Manipulation of the reproductive system of feral goats (*Capra hircus*) to increase the efficacy of Judas goats: field methods utilising tubal sterilisation, abortion, hormone implants and epididymectomy. PhD Thesis, School of Natural and Rural Systems Management. University of Queensland, Gatton.
- Cruz, F., Carrion, V., Campbell, K. J., Lavoie, C., and Donlan, C. J. (2009). Bio-Economics of Large-Scale Eradication of Feral Goats from Santiago Island, Galápagos. *Journal of Wildlife Management*, 73, 191-200.
- Gentle, M. (2006). Red fox. Pest status review. Queensland Natural Resources and Water.
- Murray, PJ, Rogie, M, Fraser, N, Hoy, JM, Kempster, S (2020). Development of the Mata Hari Judas queen (*Felis catus*). *Animals* 2020, 10(10), 1843; <https://doi.org/10.3390/ani10101843>.
- Saunders, G., Gentle, M., and Dickman, C. R. (2010). The impacts and management of foxes *Vulpes Vulpes* in Australia. *Mammal Review* 40, 181–211.

Licences and permits

Any required licences and/or permits to undertake the procedure(s) under this SOP must be obtained before undertaking this SOP.

SOP approval and review history

Date	Version	Review pathway	Notes
29 April 2021	0.0	15/04/2021 USQ AEC “Subject to Modifications.” 29/04/2021 Reviewed and approved by the USQ AEC Executive.	approved for use under project 20REA009
23 June 2021	0.1	23/06/2021 Added under “Licences and permits”, the words: “Any required licences and/or permits to undertake the procedure(s) under this SOP must be obtained before undertaking this SOP.”	N/A