

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

- *Felis catus*

Purpose

The purpose of this SOP is to provide information to people considering use of the Mata Hari Judas female technique for detecting and control on wildlife, principally vertebrate pest 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 domestic cat, *Felis catus*, an introduced predator, is a major global conservation problem and a significant threat to biodiversity (Legge *et al.* 2020). Not only is it ubiquitous, inhabiting almost every corner of Australia and its larger islands but it also a generalist and opportunistic predator of many of our native species (Murphy *et al.* 2019; Nogales *et al.* 2013). Their diet consists of a range of mammals, birds, reptiles, particularly in the critical range between 35 and 5,500 grams, and feral cats are estimated to kill between 1 and 2 billion vertebrates every year (Legge *et al.* 2020). Unsurprisingly cats have been implicated as the primary casual factor in the extinction of approximately 30 species in Australia and continue to contribute to the decline of many more (Legge *et al.* 2017; Murphy *et al.* 2019). Furthermore, extinction rates of insular species, due to cats, is exceptionally high and poses a concern considering the disproportionately high biodiversity found on islands (Legge *et al.* 2017; Nogales *et al.* 2013). Additionally, cats are a competitor of food resources to native predators such as quolls (Legge *et al.* 2020).

Management of cats is not a new concept, with baiting, trapping and shooting all used as traditional control methods (Legge *et al.* 2020). These methods all have limitations, such as native animals consuming poison bait, and generally are only capable of reducing the local populations as opposed to eradicating them. Although there have been a number of islands around the world where cats have been successfully eradicated, the eradication programs have spanned years with increasing costs and labour requirements due to the difficulties associated in catching remnant cryptic cats (Nogales *et al.* 2013). As such none of the traditional control methods are considered 100% effective and innovative and more efficient management of cats is needed.

One technique used to successfully eradicate other vertebrate pests, as yet untested with cat *in situ*, is the Mata Hari Judas technique (Cruz *et al.* 2009). This is a technique where a female (in this case queens) 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.* 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 part of her Ph.D.). 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 Mata Hari Judas 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 queen in oestrus and demonstrate that they are as effective as the live queen in oestrus, to attract and therefore detect other cats, then we overcome the welfare issues of using live Mata Hari Judas females.

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 *in situ* in the wild such that members of her species can find her. The vennel is a relatively large, movable self-contained (e.g. nest box, with food and water) structure designed to not only protect the MHJ queen 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 wildlife, while also recording by camera visitation to the vannel by animals that may not get caught. Tasmanian devil pipe traps have been used to successfully trap cats (e.g. Fancourt *et al.* 2015).

By using the same logic, i.e. use of a vannel, with traps and cameras, that has the same smell and has broadcasts of vocalisations from a queen in oestrus we can determine if we actually need the live queen or the attractiveness of her smell and vocalisation is sufficient to attract and then trap members of the same species.

Definitions

MHJ	Mata Hari Judas
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Linked SOPs

SOP ID number	SOP title
WL016	Development of the Mata Hari Judas queen

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, hat)
- Gloves
- Eye protection
- Enclosed boots

Animal wellbeing considerations

Perceived stressors	Management strategy
Poor appetite, lack of offered food eaten	Feed good quality dried cat food and monitor feed and water intake, and faecal output to determine if diet is eaten and if any digestive problems occur (indications include diarrhea, vomiting). Change diet if necessary, repeat process.
Two weeks (maximum) confinement	Cats are normally solitary animals except during the breeding season and are kept in much smaller kennels. However, while in confinement in the vannel to alleviate the potential pain and distress from isolation and confinement provide the queens with enrichment (e.g. scratching post) and place a plastic 'shell pool' sandpit containing beach sand for her in the bottom of the vannel.
Severe weather risk	If a severe weather event is forecast during the second week of the time that Mata Hari Judas queens are in their vannel they will be taken from the vannel euthanised (by Vere Nicholson or Conrad Daniels). If a severe weather event is forecast during the first week MHJ queens are in their vannel they will be euthanised (by Vere Nicholson or Conrad Daniels) and the project will be restarted from the trapping of the initial MHJ queen.

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 (1.5 x 1.5 x 1.8 m) i.e. a self-contained 'kennel' with an automatic feeder, waterer and enrichment, internal nest box (40 x 40 x 40 cm) and shelves (30 cm wide and across the width of the vannel) that protect the animal inside from rain and sunlight and access from animals outside the vannel (Figure 1 below). The vannel has a double roof to reduce the heat from the sun inside the vannel.
- Vehicle and 6 x 4 trailer to transport vannel and associated equipment
- Tool kit (i.e. range of screwdrivers, spanners, spare bolts, screws, pliers, hammer) and roll of tie wire
- Hinges and associated bolts to attach PVC pipe traps to the vannel (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)
- Four Tasmanian devil PVC pipe traps typically about 30 cm in diameter about 90 cm long required for each vannel.
- Feed and water supply for vannel sufficient for the duration of the time animals are held, typically less than a month.
- 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).
- Jerry cans of fresh water, bags of dry cat kibble.
- Camera traps (plus batteries and SD cards) and star pickets
- Monitoring sheets
- Gardening and disposable examination gloves

Site specification or location requirements

At locations/fields outlined in a USQ AEC approved application that includes the use of this SOP.

Duration of the procedure (see Table 1- Timetable of activities)

- Several hours to purchase and organise equipment; then travel to location where vannel is to be set-up.
- An hour to set up vannel and traps to capture animals.
- Five minutes each daily visit to check traps for trapped animals.
- Five minutes to determine whether the animal has a microchip and its status e.g. domesticated, stray or feral
- About 1 hour for one animal to sedate, do health check and implant Compudose-100 implant, then recover from sedation.

Procedure

1. Collect and transport all sections - four walls, roof panels, nest box, shelf, floor, four Tasmanian devil PVC pipe traps per vannel, automatic feeder, automatic waterer and construct vannel in desired location using tools in tool kit.
2. Set up camera traps on and around vannel to observe visitation by animals to vannel, and MHJ queen inside the vannel.
3. An adult female cat (queen) will be obtained from trapping efforts on the property and using SOP 'Development of Mata Hari Judas female' implant her with the appropriate dose of Compudose-100 and then place her into the vannel.
4. Each morning go to the vannel check the queen and remove animals from traps.
5. Release any native animals caught in traps.

6. If a cat is caught then it will be scanned for a microchip. At study site one where we capture a microchipped animal we will contact the property manager for advice about routine procedures for owned captured animals on the property. At study site two where we capture a microchipped animal we will contact Conrad Daniels about routine procedures for owned captured animals on Bruny Island.
7. If the cat is determined to be stray or feral it will be humanely euthanised by captive bolt, a firearm of an appropriate calibre, lethal injection, or another recommended method suitable for a given species or context. The animals will be euthanised by Dr Vere Nicholson (study site one) or Conrad Daniels (study site two).
8. If a cat is captured in the PVC pipe traps and required to be transported, the trapped cat in the pipe traps will then be placed into a hessian bag to allow for easy transportation (in an airconditioned vehicle). To stop the pipe traps from rolling the cat inside the pipe trap, inside the hessian bag, will be placed in a cardboard box to stop the pipe trap from rolling during transport.

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

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Licences and permits

Any required licences and/or permits to undertake this SOP must be obtained before using this SOP.

SOP approval and review history

Date	Version	Review pathway	Notes
5 July 2021	0.0	10/06/2021 USQ AEC "Subject to Modifications." 05/07/2021 Reviewed and approved by the USQ AEC Executive.	N/A

