UniSQ AEC Standard Operating Procedure

Fitting GPS tracking collars to feral cats

UniSQ AEC SOP ID: WL018

This Standard Operating Procedure (SOP) is applicable to all UniSQ 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 procedure is to provide information to people considering use of the GPS radio tracking technology on principally vertebrate species, and an understanding about how to fit a GPS collar on a feral cat in the field.

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 is also a generalist and opportunistic predator of many of our native species (Nogales *et al.* 2013; Murphy *et al.* 2019). Their diet consists of a range of mammals, birds, reptiles, particularly in the critical range between 35 and 5,500 g, 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 disproportionally high biodiversity found on islands (Nogales *et al.* 2013; Legge *et al.* 2017). Additionally, cats are a competitor of food resources to native predators such as quolls (Legge *et al.* 2020).

Management of feral 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 cat populations as opposed to eradicating them. Although there have been a number of islands around the world where cats have been successfully eradicated, these 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 cat traditional control methods are considered 100% effective and innovative and more efficient management of cats is needed.

In order to better manage invasive species, such as the domestic cat we have to better understand their ecology and behaviour (Bengsen *et al*. 2012; Buckmaster and Dickman 2012). The ecology and behaviour of the domestic cat is difficult to study as they are a naturally wary and cryptic species. Additionally, their elements of their ecology, for example their home range can vary dramatically depending on the location and a range of other factors (Bengsen *et al*. 2012). This critical information about their spatial ecology can assist in informing where control devices are placed and how many are necessary for the control methods to be successful and efficient (Bengsen *et al*. 2012).

The use of GPS collars on wildlife has become increasingly popular in wildlife research and is coupled with regular advances in the technology available (Matthews *et al.* 2013). GPS collars allow us to gather more data than previously possible with labour intensive VHF radio telemetry technology (Recio *et al.* 2011; Buckmaster and Dickman 2012). The applications for the data collected for GPS technology is extensive, with common uses being the determination of home range, overlap of home range and understanding how an animal moves through their environment.

By using the same logic i.e. use of a GPS radio collar on a feral cat, we can gather information regarding their ecology and behaviour to inform and improve the effectiveness of future control efforts of this highly invasive species.

Definitions

MHJ	Mata Hari Judas

Linked SOPs	
SOP ID number	**SOP title**
Not applicable	

Potential hazard to Research Workers

UniSQ Risk Management Plan ID number	UniSQ 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)
- Eye protection
- Enclosed boots
- Heavy duty 16” or similar welding gloves

Animal wellbeing considerations	
Perceived stressors	**Management strategy**
Weight of the GPS collar	Individuals will be weighed prior to the attachment of the GPS collar to ensure that the GPS collar is below 5% of its body mass. In previous studies on cats they have been fitted with commercially available, specifically designed GPS radio collars, that are a fixed size that are less than 5% of the body mass of the animal without any negative impacts.
GPS collar not fitted correctly	Care will be taken to ensure that the GPS collar is the appropriate diameter for the animals’ neck size. The transmitter will be attached via a collar which will be fitted around the neck, secured in a way that prevents it from slipping off easily, but without being too tight that it may cause pain or injury to the animal. Typically, tightness of the collar is determined by inserting a finger between the collar and the animals neck which removes the ‘gap/slackness’ of the collar around the animals neck but still means the cat and the collar can move comfortably.
Restraint	The GPS collar will be fitted quickly, with care taken to ensure it is fitted correctly. The part of this process of GPS collaring where an animal is to be restrained is only expected to take a few minutes. This will minimise the time the animal is restrained and potentially stressed.

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

☐ High ☐ Medium ☒ Low

Substances to be administered			
Substance	**Dose**	**Route**	**Purpose**
Aflaxalone	5 mg/kg liveweight	Intramuscular	Provides muscle relaxation, chemical restraint, and general anaesthesia

Equipment/ materials required

- GPS tracking collars

- Spring balance
- Thick blanket
- Heavy duty 16” or similar welding gloves

Site specification or location requirements

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

Duration of the procedure

- 30 minutes maximum

Procedure

1. Prepare the equipment required for the procedure to minimise time where the animal is being restrained. Bring the cat in the trap to a shaded area where the procedure can be completed.
2. Weigh the animal in the trap and subtract the trap weight to get the total weight of the cat.
3. Using the cats weight, calculate 5% of its body weight to ensure that the GPS collar to be attached will not exceed the 5%.
4. **Option 1**: If the cat is calm remove it from the trap using a thick blanket and welding gloves. Restrain the animals with two hands. One hand should be placed behind the jaws to control the head end. The other hand shoul be placed over the back end of the animal approximately to control the back end. Ensure that face and limbs of the animal are facing away from the person restraining the animal (Department of Biodiversity, Conservation and Attractions 2017; Division of Comparative Medicine *n.d.*).
   Option 2a: If the cat is agitated, if using a ‘crush’ cage trap (Figure 1 below), inject alfaxalone intramuscularly 5 mg/kg liveweight though the cage wires.
   Option 2b: Remove the cat as for Option 1 and then inject alfaxalone intramuscularly 5 mg/kg liveweight.
   Note that if Options 2a or 2b are used these require that a veterinarian administer the alfaxalone.
5. Whilst one person restrains the animal the other swifty attaches the GPS radio collar to the neck of the animal. Use the appropriate hole in the collar to achieve the right diameter for the animal’s neck. The collar should be fitted in a way that prevents it from slipping off easily, but without being too tight that it may cause pain or injury to the animal. Typically tightness of the collar is determined by inserting of a finger between the collar and the animals neck which removes the ‘gap/slackness’ of the collar around the animals neck but still means the cat and the collar can move comfortably.
6. Ensure that the GPS collar is fitted correctly and the antennae is in the correct position for the specific model to ensure the data can be retrieved.
7. Release the animal back into the trap. Briefly monitor animal in the trap to check for correct movement and any issues.
8. Carry the trap back to the capture site and release the animal. Visually monitor the animal until it has left your field of view.

¥See ACES Crush Cage - ACES AU (animal-care.com.au) as an example of a cat crush cage trap. This is similar in design to Figure 1 below.

Figure 1: Cage trap with sliding ‘crush door’ showing how an animal can be restrained to allow an injection to be given

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 UniSQ research supervisors or qualified individuals prior to undertaking procedures.

References

Department of Biodiversity, Conservation and Attractions (2017). *Standard Operating Procedure: Hand Restraint of Wildlife.* Department of Biodiversity, Conservation and Attractions, Perth. https://www.dpaw.wa.gov.au/images/documents/plants-animals/monitoring/sop/sop_hand_restraint_of_wildlife_v1.1_2017.pdf

Division of Comparative Medicine (*n.d.). Standard Operating Procedure – Cat Husbandry,* University of South Florida, Tampa, viewed 1 February 2020, https://www.usf.edu/research-innovation/comparative-medicine/documents/sops/s200-cat-husbandry.pdf

Bengsen, A.J., Butler, J.A., and Masters, P. (2012). Applying home-range and landscape-use data to design effective feral-cat control programs. *Wildlife Research* 39: 28-265.

Buckmaster, T., and Dickman, C.R. (2012). Feral Cats in the Tall Forests of Far East Gippsland, Australia. *Proceedings of the Vertebrate Pest Conference* 25: 54-60.

Legge, S., Woinarski, J.C.Z., Dickman, C.R., Doherty, T.S., McGregor, H., and Murphy, B.P. (2020). Cat ecology, impacts and management in Australia. *Wildlife Research* 47: i-vi.

Legge, S., Murphy, B.P., McGregor, H., Woinarski, J.C.Z., Augusteyn, J., Ballard, G., Baseler, M., Buckmaster, T., Dickman, C.R., Doherty, T., Edwards, G., Eyre, T., Facourt, B.A., Ferguson, D., Forsyth, D.M., Geary, W.L., Gentle, M., Gillespie, G., Greenwood, L., Hohnen, R., Hume, S., Johnson, C.N., Maxwell, M., McDonald, P.J., Morris, K., Moseby, K., Newsome, T., Nimmo, D., Paltridge, R., Ramsey, D., Rea, J., Rendall, A., Rich, M., Ritchie, E., Rowland, J., Short, J., Stokeld, D., Sutherland, D.R., Wayne, A.F, Woodford, L., and Zewe, F. (2017). Enumerating a continental-scale threat: How many feral cats are in Australia? *Biological Conservation* 206: 293-303.

MacLeod, A., Cooke, S.C., and Trillmich, F. (2020). The spatial ecology of invasive feral cats *Felis catus* on San Cristóbal, Galápagos: first insights from GPS collars. *Mammal Research* 65: 621-628.

Matthews, A., Ruykys, L., Ellis, B., FitzGibbon, S., Lunney, D., Crowther, M.S, Glen, A.S., Purcell, B., Moseby, K., Stott, J., Fletcher, D., Wimpenny, C., Allen, B.L., Van Bommel, L., Roberts, M., Davies, N., Green, K., Newsome, T., Ballard, G., Fleming, P., Dickman, C.R., Eberhart, A., Troy, S., McMahon C., and Wiggins, N. (2013). The success of GPS collar deployments on mammals in Australia. *Australian Mammalogy* 35: 65-83.

Murphy, B.P., Woolley, L., Geyle, H.M., Legge, S.M., Palmer, R., Dickman, C.R., Augusteyn, J., Brown, S.C., Comer, S., Doherty, T.S., Eager, C., Edwards, G., Fordham, D.A., Harley, D., McDonald, P.J., McGregor, H., Moseby, K.E., Myers, C., Read, J., Riley, J., Stokeld, D., Trewella, G.J., Turpin, J.M., and Woinarski, J.C.Z. (2019). Introduced cats (*Felis catus*) eating a continental fauna: The number of mammals killed in Australia. *Biological Conservation* 237: 28-40.

Nogales, M., Vidal, E., Medina, F.M., Bonnaud, E., Tershy, B.R., Campbell, K.J., and Zavaleta, E.S. (2013). Feral Cats and Biodiversity Conservation: The Urgent Prioritization of Island Management. *BioScience* 63: 10, 804-810.

Recio, M.R., Mathieu, R., Denys, P., Sirguey, P., and Seddon, P.J. (2011). Lightweight GPS-Tags, One Giant Leap for Wildlife Tracking? An Assessment Approach. *PLoS ONE* 6(12): e28225.

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** UniSQ AEC "Subject to Modifications." **05/07/2021** Reviewed and approved by the UniSQ AEC Executive.	N/A
6 August 2024	0.1	**11/04/2024** UniSQ AEC "Subject to Modifications." **6/08/2024** Reviewed and approved by the UniSQ AEC Executive.	N/A