

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

- Small vertebrates

Purpose

This SOP aims to provide information to people considering use of pitfall traps in surveys and research of wildlife populations, what pitfall traps are, what they are used for, and how to install and use them.

Population surveys and monitoring play a key component to many ecological research projects. Population data is obtained through ecological survey techniques such as camera, care, Elliott and pitfall trapping. Pitfall trapping is one of the most well-established techniques for ecological surveys, having been used for decades with many variations in designs (e.g. Woodcock, 2005; Ribeiro-Júnior et al., 2011) relating to the size and depth of the pitfall trap and use of preservatives and fences. The success of a pitfall trap relies on the activity and locomotion of the target species; however, pitfall traps function as an opportunistic method of trapping any vertebrates or invertebrates species that drops in (Friend et al., 1989; Ribeiro-Júnior et al., 2011; Palmeirim et al., 2019). Trapping is an effective method of obtaining species diversity and abundance data, calculated from the number of species (and individuals in each species) caught over a set trapping period. This data becomes the foundation for conservation project development, aids in understanding wildlife ecology and improving current research practices. Typically, you decide the length of time that trapping will take place prior to the start of trapping, which can be short as three days or extend to weeks. Depending on environmental conditions (typically rainfall and temperature) pitfall trapping capture rates can be 0% (no animals caught; typically in prolonged dry and cold conditions) or infrequently over 100% (e.g. over 100 animals caught per 100 traps in each day of trapping; this can occur on warm nights in spring/summer after regular rainfall for several years).

Pitfall traps are typically made from plastic, and two main types are commonly used for small terrestrial vertebrates, i.e. amphibians, reptiles (e.g. dragons and skinks) and small mammals (e.g. native and introduced mice). These are a 10 or 20 litre bucket buried in the ground or 150 mm diameter PVC pipe buried 0.5 m in the ground with the opening of the bucket or PVC pipe flush with the ground. Both buckets and the PVC pipe (capped at the bottom) have 1 mm holes drilled in the bottom for drainage. Within the pitfall trap are typically placed a floatation device (a piece of polystyrene) and shade (half a plastic pie dish); both offer protection from the sun (at midday depending on the time of the year), and the polystyrene allows animals to float on if unexpected rainfall occurs.

Once installed, pitfall traps are often left in the ground to conduct surveys at different times of the year or annually to record seasonal or annual changes in species diversity and abundance. If left *in situ* and not in use, 150 mm diameter PVC pipe pitfall traps are always sealed and covered with a solid cover. For these 150 mm diameter PVC pitfall traps, the top of the trap is closed with a tight-fitting 150 mm galvanised metal cap/ lid covered with a 300 mm square 20 mm thick concrete slab to protect the metal lid. For 10 or 20 litre buckets left *in situ* and not in use they should be filled with local soil. Before and after use of the pitfall trap it is emptied of soils and cleaned (using a cloth such as a dish cloth/chux), so it is obvious there are no animals in the trap.

Pitfall traps can be left open to capture diurnal and nocturnal animals, and if so, they must be checked each day at dawn to remove nocturnal animals and dusk to remove diurnal animals. If only capturing nocturnal animals, then pitfall traps are opened at dusk and closed after any caught animals are removed at dawn. To improve the capture rate of pitfall traps, depending on the landscape, drift fences can be installed. Drift fences are typically made of wood, plastic or metal, between 0.2 and 0.5 m high, partly buried, that may extend over 20 m from the pitfall trap to direct animals to a gap in the fence where the pitfall trap is placed. Drift fences can be difficult to use depending on the substrate, e.g., large rocks and involve clearing of vegetation to install with consequential environmental impacts.

Where there is no confirmed plan for future pitfall trapping – the traps should be removed, or filled in with local soil and the GPS location of each trap recorded and a steel post e.g. 1.5 m star picket placed within 0.5 m of the pitfall trap with the trap number recorded e.g. painted on the picket.

Definitions	
AEC	Animal Ethics Committee
GPS	Global Positioning System – the location on the earth
PVC	Polyvinylchloride is one of the world's widely produced synthetic plastic polymer and used in a wide range of products
SD	Secure Digital memory card for portal devices

Linked SOPs	
SOP ID number	SOP title
WL002	Pipe trapping
WL003	Photographing small vertebrates
WL004	Ear notching small mammals
WL005	Removing amphibians from pitfall traps
WL006	Removing small reptiles from pitfall traps
WL009	Microchipping cane toads
WL010	Handling cane toads
WL011	Euthanasia of cane toads

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 (e.g. long-sleeved shirt, long pants, hat)
- Enclosed foot ware
- Sunscreen
- Insect repellent
- Gardening gloves – for installing, opening and closing pitfall traps
- Disposable examination gloves – various sizes

Animal wellbeing considerations

Perceived stressors	Management strategy
Extreme weather	Avoid trapping or close traps in extreme weather conditions. Close pitfall traps if there is excessive rain or heavy rain forecast. Plan ahead and monitor lang range and daily weather forecasts.
Exposure in traps	Always ensure appropriate and adequate shelter in the bottom of pitfall traps to offer protection for animals against exposure to environmental conditions and predation or attack from other animals, i.e. half pie dish and float.
Trap located near an ant nest	Pitfall traps should not be placed in the vicinity of ant nests. Move trap to an area with no ant nest.
Location of trap in drainage area or low-lying area	Pitfall traps should not be placed in drainage channels or low-lying areas – and if found to be in such an area, it must be relocated to a nearby location not experiencing potential flooding.
Disease risk from bags and equipment	All handling bags and equipment should be kept clean to minimise risk of disease.

Handling of animals	Animals will be handled so as to cause minimal stress and, under normal circumstances, released as soon as processing is completed.
Stressed animal particularly associated with wet and cold conditions	Any signs of stressed animal particularly associated with wet and cold conditions will be immediately dealt with as a priority. Small mammals will be kept in a warm, dry calico bag with disposable bamboo kitchen wipes and held in a field workers jacket for a short period of time or until the animal recovers. This method is very successful in assisting small mammals to recover from cold wet conditions. In the event of extreme wet and cold conditions, traps will be shut down to prevent animals from entering.

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

- Commercial operator to dig pitfall trap holes prior to their installation which will require permission from the landowner and specific legal arrangements between the University and the landowner and the commercial operator
- 150 mm diameter PVC piping 50 cm long
- 150 mm diameter PVC pipe caps glued onto the bottom of the trap with 1 mm holes drilled in these to let water drain from traps
- 150 mm diameter metal lid fitted to the top of the PVC pipes
- 30 cm square 20 mm thick concrete slabs
- Disposable examination gloves – various sizes
- Range of scales (10 g, 40 g, 100 g, 200 g, 1 kg, to weigh animals)
- Dish clothes (e.g. chux)
- Plastic cups - 200 ml
- 1 mm hole ear punch/notcher
- Permanent markers to label containers and inside the pitfall traps
- Calico bags – approximately 20 cm by 30 cm in size (double stitched with no loose threads on the inside and outside) with a drawstring or other method to securely close the bag, e.g. tape or string attached to the neck of the bag
- Ziplock bags (food grade quality) various sizes
- Camera, spare batteries and SD cards
- Plastic bags for rubbish
- Rolls of flagging tape to mark location of pitfall traps
- Perspex/glass petri dish and grid board to use as background to measure animals morphometrics.
- Plastic shelters (half 15 cm diameter plastic bowl)
- Polystyrene floats approx. 15 x 50 x 80 mm
- Data record sheets
- Microchip scanner
- Washbag – to place used calico bags in for washing
- Alcohol and alcohol wipes

Site specification or location requirements

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

Waste disposal

Nil.

Duration of the procedure

- Depending on the number of pitfall traps required, and staff available to install the pitfall traps in the ground, possibly 3 to 5 days for installation of 100 pitfall traps.
- Several hours to organise the equipment required for pitfall tapping.
- Check an open trap for the presence of animals – 20 seconds.
- Removal of an animal from the trap – 30 seconds.
- Processing of an animal removed from the trap – 2 to 5 minutes.
- Monitoring of a released animal near to a trap – 1 minute or until animals have moved out of sight into the surrounding vegetation.

Procedure

Before field – manufacture of pitfall traps and associated equipment

1. Purchase 150 mm diameter PVC pipe, 150 mm diameter PVC end caps and PVC glue.
2. Ensure pipe cap is securely glued to the PVC pipe and with about a dozen 1 mm holes drilled in it to allow drainage.
3. Purchase 150 mm diameter plastic pie dishes and cut in half (shelters).
4. Purchase polystyrene and cut in blocks approximately 15 x 50 x 80 mm (floats)

In field – installation of pitfall traps

1. Locate the position of each pitfall trap using flagging tape with the trap number on the flagging tape.
2. Organise commercial operator of post hole digger and after the operator has dug holes remove loose soil and place pitfall trap into the hole, then backfill soil, so the top of the pitfall trap is level with the surrounding soil using soil displaced from the hole where the pitfall trap is.
3. Clean pitfall trap, write trap number inside the top of trap (e.g. in the Billabong the third trap in the grass habitat could have trap number B3G, i.e. a unique number), insert shelter, float and close trap with metal lid and cover with concrete slab.

In field – preparation for trapping

1. Remove the concrete slab and remove the steel lid on the top of the PVC pitfall trap and place them at least a meter away from the pitfall trap. Using soil ensure that the top of the trap is flush with the ground level.
2. Ensure the inside the trap is clean of any debris and ensure that the polystyrene float and shelter piece is inside the pitfall trap.
3. Using a permanent marker, label a section of the flagging tape with the allocated trap number/ name which should be written inside the top of the pitfall trap.
4. Tie the labelled piece of flagging tape to the nearest permanent structure, e.g. tree/fence post, ensuring that the pitfall trap can be located with ease.
5. If not in use close the pitfall trap by installing the steel lid securely and cover with the concrete slab.

In field – checking traps and processing animals

1. Using a stick longer than the pitfall trap, gently lift the plastic shelter and float to observe if there are any animals in the pitfall trap.
2. If nothing is caught, ensure pitfall trap is clean, removing any debris or leaf litter and close the trap if no longer required.
3. If trap has been successful and an animal has been caught, ensure all required equipment is laid out within reach.
4. Pre-fill trapping data sheet with non-animal related details such as trap number/day/date/time/ bag weight, etc.
5. Put on clean disposable gloves.
6. Gently remove plastic shelter using a stick.
7. Remove the animal from the pitfall trap as per the appropriate SOP.
8. Ensure all required data is collected for each animal as per the appropriate SOP, and release the animal in an area near the trap it was caught in, where there is an appropriate shelter for that animal.
9. Ensure all equipment is cleaned after use, and place all used zip-lock bags and gloves in the rubbish bag after use. It is important not to use the same gloves/ bags between animals to prevent the spread of diseases.

10. Move onto the next pitfall trap and repeat this procedure until all pitfall traps have been checked.

Training, qualifications or competencies required

Researchers with relevant experience or qualifications 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

- FRIEND, G. R., SMITH, G. T., MITCHELL, D. S. & DICKMAN, C. R. 1989. Influence of Pitfall and Drift Fence Design on Capture Rates of Small Vertebrates in Semi-Arid Habitats of Western-Australia. *Wildlife Research*, 16, 1-10.
- PALMEIRIM, A., BENCHIMOL, M., PERES, C. & VIEIRA, M. 2019. Moving forward on the sampling efficiency of neotropical small mammals: insights from pitfall and camera trapping over traditional live trapping. *Mammal Research*, 64, 445-454.
- RIBEIRO-JÚNIOR, M. A., ROSSI, R. V., MIRANDA, C. L. & ÁVILA-PIRES, T. C. S. 2011. Influence of pitfall trap size and design on herpetofauna and small mammal studies in a Neotropical Forest. *Zoologia (Curitiba)*, 28, 80-91.
- WOODCOCK, B. 2005. Pitfall Trapping in Ecological Studies. *In*: SR, Leather (ed.) *Insect Sampling in Forest Ecosystems*. <https://doi.org/10.1002/9780470750513.ch3>

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
17/12/2020	0.0	3/12/2020 USQ AEC "Subject to Modifications." 17/12/2020 Reviewed and approved by the USQ AEC Executive.	N/A
23/06/2021	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
04/08/2023	0.2	04/08/2023 Converted SOP to new UniSQ branding and revised all reference of 'USQ' to 'UniSQ' ('waste disposal' not included in previous version)	UniSQ Rebrand
24/08/2023	1.0	03/08/2023 UniSQ AEC "Subject to Modifications" with the revised SOP to be reviewed by the UniSQ AEC Executive. 24/08/2023 Revised SOP reviewed and approved by the UniSQ AEC Executive.	Approved