

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

- *Amalosia* and other gecko species
- *Anomalopus* species
- *Cryptoblepharus* species
- *Ctenotus* species
- *Lampropholis* species
- *Menetia* species
- *Morethia* species
- *Pogona barbatus* and other dragon species
- *Pygopus* and other legless lizard species
- Other reptile species captured

Purpose

The purpose of this SOP is to provide information to people considering the use of pitfall traps in surveys and research on small reptiles, on how to remove small reptiles from pitfall traps, process them and then release 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, cage, 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 vertebrate or invertebrate species that drop 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 as 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 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 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 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
Small reptile	Any reptile less than 200 mm in length

Linked SOPs	
SOP ID number	SOP title
WL003	Photographing small vertebrates
WL005	Removing amphibians from pitfall traps
WL007	Removing small mammals from pitfall traps
WL012	Dry pitfall trapping for vertebrates

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 sleeve shirt, long pants, hat)
- Enclosed footwear
- Sunscreen
- Insect repellent
- Gardening gloves (for closing pitfall traps)
- Disposable examination gloves

Animal wellbeing considerations	
Perceived stressors	Management strategy
Extreme weather	Avoid trapping or close traps in extreme weather conditions. Pitfall traps should be closed if there is excessive rain or heavy rain forecast. Plan ahead and monitor long-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 ant nest	Pitfall traps should not be placed in the vicinity of an ant nest. 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	All handling bags and equipment should be kept clean to minimise the 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 associate with wet and cold conditions	Any signs of stressed animal particularly associated with wet and cold conditions will be immediately be dealt with as a priority. 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

- Disposable examination gloves (various sizes)
- Range of scales (10 g, 40 g, 100 g, 200 g, 1 kg to weigh animals)
- Ruler – measured to 1 mm accuracy
- Calico bags (approx. 20 by 30 cm in size, double stitched with no loose threads inside or outside of the bags) – with drawstring or other methods of securely closing the bag, i.e. tapes or strings attached to the neck of the bag
- Zip-lock food-grade plastic bags (various sizes)
- Plastic bags for rubbish
- Washbag – to place used calico bags into
- Datasheets
- Alcohol and alcohol wipes
- Cloth such as a dish cloth/chux

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

- Several hours to organise all the equipment required
- Checking open trap for animals – 20 seconds
- Removal of animal from trap – 30 seconds
- Processing the animal – 2 to 5 minutes
- Monitoring animal upon release – 1 to 30 minutes or until the animal has moved out of sight into the surrounding vegetation

Procedure

1. Locate the position of the pitfall trap from flagging tape with trap number written on it.

2. Use a stick longer than the pitfall trap to gently lift the plastic shelter and float to confirm an animal is in the pitfall trap.
3. Pre-fill trapping datasheet with non-animal related details such as trap number/ day/ date/ bag weight.
4. Put on clean disposable gloves – ensure they aren't loose fitting.
5. Gently remove plastic shelter from pitfall trap using a stick.

Small reptiles less than 200 mm length (from tip of head to end of tail)

1. For reptiles shorter than 200 mm (i.e. head, body and tail length), weigh and record the weight of a new zip-lock bag on the datasheet in the row where you wrote the trap number in the column labelled 'Wt bag (g)'.
2. Turn plastic zip-lock bag inside out and use zip-lock bag as an additional glove; reach down into the pitfall trap and cup the reptile in the palm of your hand, so the reptile is being held within the zip-lock bag.
3. Remove your hand containing the small reptile (from the pitfall trap) and close the zip-lock bag (using the zip-lock) fully over the small reptile – ensure the bag is secure.

Record the species of animal in the first column of the data sheet in the row where you wrote the trap number, in the column labelled 'Species name'.

NOTE: If reptiles are not released immediately after being processed, they can only be kept in a zip-lock bag, with sufficient air if they are kept in cool conditions, out of sunlight for up to 3 hours, before being released.

4. Weight the small reptile in the zip-lock bag and record weight on the datasheet in the row where you wrote the trap number, in the column labelled 'Wt bag + animal (g)'. From this, you can determine the weight of the animal and write this number in the column labelled 'Wt animal (g)'.
5. While the animal is still in the zip-lock bag, undertake the following:
 - a) measure the snout-vent length (from the tip of the nose to the cloaca = head and body length) to the nearest millimetre using the ruler while the animal is placed on a flat surface (e.g. clipboard) and record this number in the column labelled 'Head and body (mm)'. Refer to Figure 1.
 - b) measure the straight tail length (from the tip of the tail to the cloaca = tail length) to the nearest millimetre using the ruler while the animal is placed on a flat surface (e.g. clipboard) and record this number in the column labelled 'Tail (mm)'.
 - c) Measure the hind leg length (groin to tip of the longest toe but do not include the nail) to the nearest millimetre using the ruler while the animal is placed on a flat surface and record this number in the column labelled 'Leg (mm)'. The nail is not included in this or foot length as they can be of varying length due to wear etc. If the leg is straight this is one measurement; if the leg is bent then add the tibia and femur to obtain leg length (Figure 1).
 - d) measure the hind foot length (heel to tip of the longest toe but do not include the nail) to the nearest millimetre using the ruler while the animal is placed on a flat surface and record this number in the column labelled 'Foot (mm)'.
6. The last data to be recorded is in the column labelled 'Fate (1-4)' write the appropriate number; where Fate: 1 = released unharmed; 2 = escaped while being handled; 3 = died in trap or while handling; 4 = to be euthanised. For reptiles, this should be 1, unless the reptile has escaped, died or has a reason to be euthanised (e.g. obvious major trauma or evidence of fungal infection). Animals that die in traps or during handling must be reported to the UniSQ AEC.
7. In the vicinity around the pitfall trap (ideally within a 1 to 2-metre radius), find vegetation that would offer safe refuge to the reptile and undo the zip-lock bag and release the animal into that vegetation. Being a reptile, the animal may sit for a few minutes and then move into the vegetation or alternatively disappear into the vegetation the moment it is released. Observe the animal until it has moved into the vegetation and if there appears to be a problem, e.g. unstable movement, record this and any other observations, e.g. missing the second toe on the left hind leg in the column labelled 'Remarks'.
8. If there was more than one reptile in the pitfall trap, repeat steps 1 to 7 for each additional animal until the trap is empty of reptiles. If there are any amphibians or small mammals, follow their respective SOP's for removing them from pitfall traps.

9. If there are no more animals in the pitfall trap, place all zip-lock bags in the rubbish bag, remove gloves and put them in the rubbish bag. Ensure all equipment is cleaned after use.
10. Move onto the next pitfall trap and repeat this procedure until all pitfall traps have been checked and all animals processed.

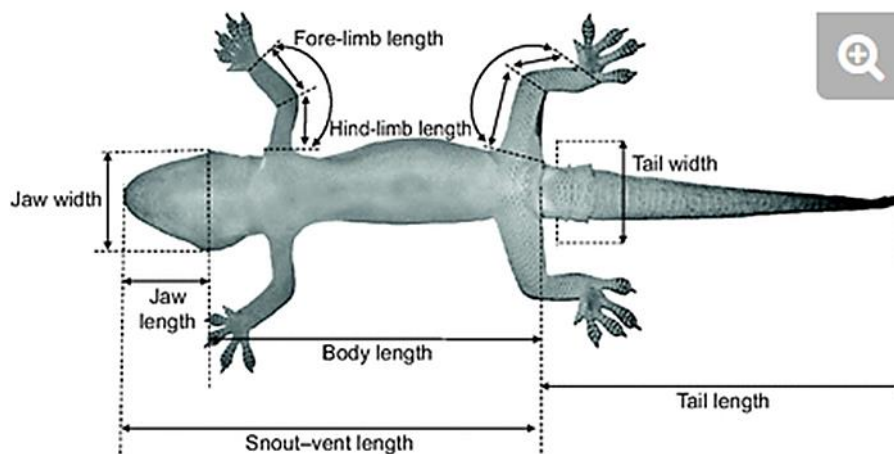


Figure 1: The ventral surface of a male Asian house gecko (*Hemidactylus frenatus*). Morphological variables; jaw width (at the maximum lateral extent of the temporal jaw-adductor musculature), jaw length (from coronoid-articular jaw joint to tip of snout), body length (from coronoid-articular jaw joint to cloaca) average fore-limb length (humerus and radius), average hind-limb length (femur and fibula), tail width (pre-caudal autonomy vertebrae) and tail length (cloaca opening to tip of tail). Snout-vent length (SVL; sum of jaw length and body length) is also shown. Taken from Cameron et al. (2013).

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

- CAMERON, S.F., WYNN, M.L. & WILSON, R.S. (2013). Sex-specific trade-offs and compensatory mechanisms: bite force and sprint speed pose conflicting demands on the design of geckos (*Hemidactylus frenatus*). *The Journal of Experimental Biology* 216, 3781-3789.
- 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 UniSQ AEC "Subject to Modifications". 17/12/2020 Reviewed and approved by the UniSQ AEC Executive.	Approved
23/06/2021	0.1	23/06/2021 Inserted 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.	Update
18/10/2022	0.2	18/10/2022 Converted SOP to new UniSQ branding and revised all reference of 'USQ' to 'UniSQ' ('waste disposal' not included in previous version)	UniSQ 2022 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