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Charles Darwin University Animal Ethics Committee

Standard Operating Procedure:
DPAW SOP 12.2020 Dry Pitfall Trapping for Vertebrates

Standard Operating Procedure No:	DPAW SOP 12.2020	Version No:	1.0
Date of Approval:	5/02/2020		
Last Amendment:	N/A		
Date for Review:	05/02/2023		

NOTE: *Section 5.3 Checking pitfall traps.* In addition to this SOP, **trap checks must be conducted within two (2) hours of dawn.**

CHARLES DARWIN UNIVERSITY AUSTRALIA

Standard Operating Procedure

DRY PITFALL TRAPPING FOR VERTEBRATES

Animal welfare is the responsibility of all personnel involved in the care and use of animals for scientific purposes.

Personnel involved in an Animal Ethics Committee approved project should read and understand their obligations under the *Australian code for the care and use of animals for scientific purposes.*

Prepared by: Species and Communities Branch, Biodiversity and Conservation Science, Department of Biodiversity, Conservation and Attractions

Prepared for: Animal Ethics Committee

Version 1.2

February 2018

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Department of Biodiversity, Conservation and Attractions (2018). *Standard Operating Procedure: Dry Pitfall Trapping for Vertebrates and Invertebrates*. Perth, WA: Department of Biodiversity, Conservation and Attractions.

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Acknowledgements
This standard operating procedure was originally developed by Christine Freegard and Vanessa Richter, with contributions from Peter Orell and Brent Johnson.

Revision History Log

Version	Date	Details	Author/Reviewer	Approved By	Approval
1.0	19/01/2009	Document created	V. Richter and C. Groom	P. Mawson P. Orell K. Morris	March 2009
1.1	23/04/2013	Minor revision	R. Kay	M. Page	July 2015
1.2	20/02/2018	Revision of content & clarification of procedures	G. Yeatman, G. Anderson, M. Page and J. Renwick	M. Cowan	February 2018

Approvals: Version 1.2

Approved by:  Date: February 2018

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Contents

1 Purpose

Pitfall trapping is a sampling technique that is widely used in a range of studies including species-specific and ecological community surveys with the purpose of describing species occurrence, relative abundance, community structure, examining spatial and temporal distribution patterns, comparing abundance of species in different habitats and studying activity patterns.

A range of taxonomic groups can be caught using pitfall traps including small mammals, reptiles, amphibians and invertebrates.

Pitfall traps consist of a container (generally a bucket or PVC tube) dug into and set flush with the ground, usually in combination with a barrier (i.e. a 'drift fence') which is used to direct traversing animals towards and into the trap. Animals fall into the trap and cannot get out due to the unscaleable surface and depth of the bucket or tube.

This standard operating procedure (SOP) provides advice on the use of dry pitfall traps for the trapping of vertebrates.

2 Scope

This SOP has been written specifically for scientific and education purposes, and endorsed by the Department's Animal Ethics Committee. However, this SOP may also be appropriate for other situations.

This SOP applies to all fauna survey and monitoring activities that may require the use of dry pitfall traps undertaken across the State by Department of Biodiversity, Conservation and Attractions (hereafter Department) personnel. It may also be used to guide fauna monitoring activities undertaken by Natural Resource Management groups, consultants, researchers and any other individuals or organisations. All Department personnel involved in the use of dry pitfall traps should be familiar with the content of this document.

Projects involving wildlife may require a licence under the provisions of the *Wildlife Conservation Act 1950* and/or the *Biodiversity Conservation Act 2016*. Personnel should consult the Department's Wildlife Licensing Section and Animal Ethics Committee Executive Officer for further guidance. In Western Australia any person using animals for scientific purposes must also be covered by a licence issued under the provisions of the *Animal Welfare Act 2002*, which is administered by the Department of Primary Industries and Regional Development. This SOP complements the *Australian code of practice for the care and use of animals for scientific purposes* (The Code). The Code contains an introduction to the ethical use of animals and should be referred to for broader issues. A copy of the code may be viewed by visiting the National Health and Medical Research Council website (http://www.nhmrc.gov.au).

3 Animal Welfare Considerations

To reduce the level of impact of pitfall trapping on the welfare of animals, staff must consider, address and plan for the range of welfare impacts that may be encountered. Strategies to reduce impacts should be identified during the planning stage to ensure that they can be readily implemented during trap setup and trap checking, and to ensure that contingencies for managing welfare issues have been identified. Ensure that all handlers and volunteers involved in the project are aware of the range of issues that they may encounter, the options that are available for reducing impact and improving animal welfare, and the process for managing adverse events.

Department projects involving pitfall trapping will require approval from the Department's Animal Ethics Committee.

The key animal welfare considerations that should be considered when pitfall trapping are listed below and are highlighted throughout the document.

3.1 Injury and unexpected deaths

If adverse events including injury, unexpected deaths or euthanasia occur then it is essential to consider the possible causes and take action to prevent further issues. For projects approved by the Department's Animal Ethics Committee, adverse events must be reported in writing to the AEC Executive Officer as soon as possible after the event by completing an *Adverse Events* form. Guidance on field euthanasia procedures is described in the Department SOP for *Humane Killing of Animals under Field Conditions.* Where disease may be suspected, refer to the Department SOP for *Managing Disease Risk in Wildlife Management* for further guidance.

3.2 Level of impact

Potential animal welfare impacts of pitfall trapping include:

- Trauma (e.g. accidental injuries inflicted during hand capture),
- Hypothermia,
- Hyperthermia,
- Dehydration (particularly for amphibians),
- Starvation,
- Distress (caused by confinement, discomfort, social isolation, separation of mother and young, exposure to predators, ants etc.),
- Death through predation (often from ants and other invertebrates).

If the pitfall traps are properly monitored and preventative actions are utilised then the impact should be low and only short-term.

4 Approved Trap Types

Plastic 20L Buckets: Plastic buckets with snap on lids (30cm diameter, 40cm deep) are one of the most common types of pitfall traps used for survey and monitoring (see Figure 1).

PVC Tube: PVC tubes are also commonly used (at least 15cm diameter, should be around 60cm deep). The bottom of the tube should have an insert, be capped, plugged or covered (e.g. a piece of flywire or similar) to prevent animals burrowing to where they cannot be seen and retrieved.

Other types of containers may be used as pitfall traps and should be clearly described in study plans and applications to the Department's Animal Ethics Committee.

Pitfall traps should contain suitable shelter for captured animals, and may require drainage holes to reduce flooding and a raised roof to provide shelter from the sun and direct rainfall (see Section 5.1).

Figure 1 A pitfall trap made using a 20L bucket with shelter provided (left) and a drift fence leading to a pitfall trap (right). Photo: Christine Freegard/DBCA.

5 Procedure Outline

5.1 Installing pitfall traps

(a) The location and configuration of pitfall trap locations and layout (e.g. transect, grid etc.), as well as the number of traps, will be determined by the purpose of the study and should be planned before commencing the survey. Consider the target species' likely use of habitat and home range, and welfare implications of trap placement when designing trap configuration and layout. Vegetation and habitat mapping may assist in survey design.

Consider the likelihood of water runoff draining into the pit as well as the likelihood of underground water levels causing problems with 'popping' of pitfall buckets (buckets will lift out of the ground).

ANIMAL WELFARE: Pitfall traps should not be placed in the vicinity of ant nests. Ants are known to distress and kill trapped animals.

When placing pitfall traps in low-lying areas (e.g. near swamps or in drainage channels), greater consideration should be given to the possibility of traps filling with water and drowning trapped animals.

(b) Trap locations must be marked to ensure that none are missed when checking or closing traps (e.g. with flagging tape which is labelled and using a numbering system that uniquely identifies trap points). A GPS reading for each trap line is strongly recommended.

Trap lines which are intended to be in place for the medium to long term (i.e. years rather than weeks or months) should be marked using a permanent post (e.g. numbered dropper post). The location information for permanent monitoring transects and their trap points should be recorded on datasheets and in a database.

(c) If setting up traps near roads or vehicle tracks, the traps must be set so that they minimise the impact on the animals. Traps should not be readily visible from roads to avoid public curiosity and possible interference. Pitfall traps can be a long-term fixture and therefore it may be appropriate to have these much further from roads than other traps which are only temporarily present.

(d) Installing a pitfall trap:

1. Measure the depth and width of the bucket or PCV tube and dig a hole that is deep enough to allow the container to fit in it.
2. Consider water drainage from within and around the trap. In sandy, well-drained soils, small (approx. 3mm diameter) holes drilled into the bottom of the trap or replacing the base of a PVC pipe with wire gauze will allow for water drainage during rainfall events. However, in areas prone to waterlogging or excessive soil water movement, holes may facilitate flooding of pitfall traps and are not recommended.
3. Place the container in the hole and fill in soil around the container ensuring the lip of the container is level with or slightly above (reduces water runoff entering traps) the ground surface. Soil needs to be compacted around the rim to avoid it caving in over time. Repeat for all traps.
4. Appropriate and adequate shelter should be provided in the bottom of the trap, including a layer of soil or leaf litter (i.e. egg cartons or foam food trays with one corner cut out, a layer of 1-2cm of soil and/or leaf litter for fossorial reptiles, damp layer of soil or leaf litter for amphibians). A raised shelter or roof can be placed over the top of the trap to prevent rain directly falling into the trap and provide shelter from the sun. Make sure the roof is wide enough to project shade well beyond the trap entrance otherwise it will have little to no effect in reducing temperature. A bucket lid suspended over the top of the bucket is generally insufficient for mitigating temperature issues.

ANIMAL WELFARE: Always provide 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. Depending on the species that you might trap, consider complexity of shelter (e.g. egg cartons may be better than foam trays), depth of soil and/or leaf litter and providing damp soil or leaf litter for amphibians.

5. Run the drift fence (approx. 25cm high and partially buried at the base) along the trap line, over the middle of the pitfall traps. Drift fence material commonly used is aluminium fly-wire mesh. Nylon fly-wire mesh can be used but requires supporting with wire pegs and/or sticks and is more prone to damage and wear and tear.

   Ensure that the drift fence runs right to the rim of the pit or across the pit so animals are not able to move through any gaps in the fence near the rim of the pit. Drift

fence should be trimmed or folded appropriately over the pits so animals do not use the drift fence as a 'walkway' across the pit.

5.2 Opening pitfall traps

(a) As identified above, ensure pitfall traps (buckets) contain appropriate and adequate shelter such as egg cartons, food foam tray, leaf litter, soil or sand for any captured animals. Ants, Carabid beetles, centipedes and scorpions are often captured in pitfall traps and can kill vertebrate species that are trapped with them. Appropriate shelter can provide a place for captured animals to hide or escape.

ANIMAL WELFARE: Avoid trapping or close traps in extreme weather conditions. Close pitfall traps if there is excessive rain or heavy rain is forecast. Plan ahead and monitor long-range and daily weather forecasts.

(b) Before the trap is left, it is important to check that it is all set up correctly.

ANIMAL WELFARE: If an ant nest is noticed in the vicinity of an installed trap and ants are likely to be an issue, close the trap.

(c) Depending on the purpose and target species it is often recommended that traps are set for a minimum of seven nights.

5.3 Checking pitfall traps

ANIMAL WELFARE

In determining the duration and frequency of trapping you should consider the purpose of your study and the potential welfare impacts from recapturing animals on multiple occasions (e.g. limitations on feeding, welfare of dependent young). Consider the duration and frequency that will allow the goal of the activity to be achieved with the minimal impact on animals. Pitfall trapping can greatly impact the wellbeing of animals by disrupting their feeding, foraging and defending territory activities. This is particularly relevant to small mammals (e.g. honey possums) which due to their small size, are at risk of death if prevented from feeding. Where honey possums are prevalent, a sugar solution (e.g. Spark) should be available when checking traps.

Spring to early summer is usually the optimal time for pitfall trapping and this coincides with breeding of many mammal species. If captured, lactating females should be released as soon as possible. If the same lactating female is caught on successive nights, consideration should be given to closing the trap.

Rainfall events that occur during a trapping session in a normally dry weather period can result in a number of species becoming active that may not normally be trapped (e.g. amphibians and some species of ants and other invertebrates). It is essential that staff monitor and manage these often large 'emergence' events to ensure that welfare of animals is not compromised. Modifications to trap set up and increased trap checking may be required when large numbers of adult and metamorph amphibians appear.

(a) It is vital that extreme care is taken when checking traps in case venomous animals are caught inside. It is best to use long handled tweezers or tongs to check for venomous snakes and invertebrates before putting hands in. Gloves or padded tongs can be used to

remove potentially harmful animals; however, particular care needs to be taken not to injure them.

(b) Timing of trap checking:

ANIMAL WELFARE: The timing and frequency of trap checking and clearing should be determined by giving consideration to the behaviour and biology of the target species (and potential by-catch species) in association with the environmental conditions at the site. Trap checking timing and frequency should be reviewed and adapted when and if conditions change or adverse events occur. Traps may need to be checked more frequently throughout the day and/or night if prolonged trap confinement or environmental conditions are likely to increase the impact on animal welfare and affect survivorship.

For pitfall trapping, traps need to be checked more frequently throughout the day if weather conditions are of concern for captured species, capture rate is high or the combination of species trapped results in unacceptable trap deaths through predation or attack.

Reptiles in arid environments often adjust activity in relation to ambient conditions with peaks for diurnal species mid to late morning and again late afternoon. Trap checking in these areas should be adapted to the conditions (e.g. take place early and late morning to avoid confinement of trapped animals throughout the heat of the day). The risk of animals entering traps during the hottest part of the day lower for most species as they will be sheltering during this time.

If traps are to remain open overnight at a site where nocturnal small mammals may enter traps, trap checking must occur early morning before temperatures impact on the welfare of the animals in the trap and /or timing of release of the animals will negatively impact on their welfare. Checking traps within three hours of sunrise is the Department's standard timeframe for nocturnal mammal captures and anything differing from this should be justified.

(c) All traps must be accounted for during each day's trapping. Personnel undertaking the trapping should keep tallies of traps to ensure that all are inspected, closed or removed as appropriate. This is the responsibility of the person in charge at the survey location on the day. There is no excuse for leaving traps unchecked.

(d) Remove invertebrates from the pitfalls each day and release a reasonable distance away from the pitfall trap.

(e) The presence of ants in the trapping area can lead to detrimental impacts on captured animals. A small amount of surface insecticide (e.g. permethrin-based products) can be applied on ant trails or in traps to discourage ants when they are observed or when they are likely to become an issue. Only very small amounts (i.e. a single puff from a puffer pack) should be used in traps and mixed through the soil surface and this should be evenly spread so it is not possible for vertebrates to actively ingest or be exposed to large quantities of the insecticide. This should not be used as a default action and is only appropriate where ants are entering and remaining in traps. Generally liquid or spray insecticides should not be used inside traps and extreme care must be taken to ensure that no free standing liquid droplets remain when using liquid-based permethrin as absorption/ingestion can be lethal to frogs and reptiles. Always read the MSDS of chemicals before use.

A thin reed or stem can also be placed in the trap to provide an opportunity for ants to exit. If ants become highly attracted to the trapping area it may be necessary to either close or remove the traps and relocate them to a more suitable position.

(f) Carry a range of appropriate handling bags when approaching a trap to ensure efficient removal of trapped animals.

(g) At the end of trapping, remove, fill in or close all traps. When closing pitfall traps, personnel must ensure that lids are secure and cannot come off other than by human intervention. Cover with sand, soil, leaf litter and/or rocks to weigh down the lid and reduce potential UV exposure and fire damage. Ensure through appropriate means that all traps left *in situ* can be located in the future.

(h) Personnel in charge of the survey or monitoring activity are responsible for ensuring all pitfall traps are securely closed.

5.4 Removing animals from pitfall traps

All animal handling should be done by (or under the guidance of) trained and competent personnel. Techniques for removing animals from traps vary depending on the species of invertebrate, mammal, reptile or amphibian involved and the experience and skills of personnel. General advice on handling animals is contained in the Department SOP for *Hand Restraint of Wildlife*.

(a) Use handling bags appropriate for the species and length of containment as advised in Department SOP for *Animal Handling and Restraint using Soft Containment*.

ANIMAL WELFARE: All handling bags and equipment should be kept clean to minimise risk of disease, contamination, etc. Refer to the Department SOP for *Managing Disease Risk in Wildlife Management* for further guidance.

(b) Removal should be as quick and as efficient as possible, with the least amount of stress.

(c) Process animals as quickly and efficiently as possible so that stress is kept to a minimum. Use appropriate field equipment for the species you are likely to target.

ANIMAL WELFARE: To ensure minimal stress to the animals, they should only be handled for as long as required to identify them and to collect any necessary measurements (usually no more than five minutes).

(d) Record trapping data on an appropriate trapping datasheet and database.

(e) Release animals at point of capture at an appropriate distance away from the pitfall trap; generally a few metres from the trap (unless the purpose of the trapping is for translocation, specimen collection or other approved reasons). Animals should be released as soon as possible and at an appropriate time. Animals must be released, or reach an alternate endpoint approved by the Department's Animal Ethics Committee, within 24 hours of capture unless approval is given otherwise. Animals should be released into good shelter and caution taken to reduce exposure to risks such as predation.

(f) If an animal is injured during trapping or handling, treat any superficial wounds (refer to the Department SOP for *First Aid for Animals*). If trapping honey possums (*Tarsipes*

rostratus) consider offering rehydrate (e.g. Spark Liquid) to lethargic individuals prior to release.

(g) If an animal is seriously injured, refer to the flowchart in the Department SOP for *Humane Killing of Animals under Filed Conditions* to make the decision on whether or not to euthanase or seek veterinary care. A euthanasia action plan should be developed before undertaking field work.

5.5 Identification

The taxonomy of many of the species captured by pitfall traps can be dynamic. Some species may not be in field guides or fully described in and can be difficult to identify accurately. Staff should try to stay up to date with taxonomic revisions for species they are likely to be trapping (the WA Museum may be able to assist with this). If trapping in new or poorly surveyed areas, staff should contact the WA Museum or other taxonomists to check if new specimens/tissue are required. Any trap deaths should be retained and offered to the museum.

5.6 Removing pitfall traps

(a) All traps must be counted out upon setting traps and counted in when removing (filling in) traps. Personnel undertaking the trapping should keep tallies of traps to ensure that all are removed and that there are no traps left behind.

(b) Remove flagging tape etc. from area

6 Trap Care and Maintenance

(a) Traps must be maintained in good working order.

(b) Traps must be removed and holes filled in if they will no longer be used, or securely covered if they will be used again. Plastic lids deteriorate when exposed to sunlight and should be completely covered with soil between trapping sessions. Covering lids also provides some protection from fire. Pitfall traps must be checked as soon as possible after a fire, to ensure that none of the traps are open. Neglect will lead to unnecessary deaths of animals.

(c) When pitfall traps and fences are removed or are being moved between sites, they must be cleaned and disinfected, especially when used in areas affected by dieback (*Phytophthora cinnamomi*).

(d) Any damaged traps/drift fences requiring attention need to be noted and repaired or replaced before subsequent use.

(e) Spare lids for pitfall traps should be kept available and carried in the field when closing pitfall traps.

7 Competencies and Approvals

Department personnel, and other external parties covered by the Department's Animal Ethics Committee, undertaking monitoring projects involving the use of dry pitfall traps

require approval from the Committee and will need to satisfy the competency requirements detailed in Table 1. This is to ensure that personnel involved have the necessary knowledge and experience to minimise the potential impacts of dry pitfall traps on the welfare of the animals. Other groups, organisations or individuals using this SOP to guide their fauna monitoring activities are encouraged to also meet these competency requirements as well as their basic animal welfare legislative obligations.

It should be noted that details such as intensity of the study being undertaken will determine the level of competency required and Table 1 provides advice for basic monitoring only.

Table 1 Competency requirements for Animal Handlers of projects using dry pitfall traps to capture vertebrates and invertebrates

Competency category	Competency requirement	Competency assessment
Wildlife licences	Licence to take fauna for scientific purposes (Reg 17) OR Licence to take fauna for educational or public purposes (Reg 15)	Provide licence number
Formal training *Note: Suitable levels of skills/experience can substitute for formal training requirements*	Department Fauna Management Course or equivalent training	Provide course year
General skills/experience	Relevant knowledge of species biology and ecology	Personnel should be able to correctly identify the likely species to be encountered in pitfall traps for the site/s being studied. This knowledge may be gained through sufficient field experience and/or consultation of field guides and other literature. Estimated total time in field: Min 1 year involved in similar projects.
Fauna survey and capture skills/experience	Experience in setting and use of live traps	Personnel should be confident at hand capture of the range of species likely to be captured. This experience is best obtained under supervision of more experienced personnel. Estimated total time in field: Min 1 year involved in similar projects.
	Training and experience in trap hygiene, disease transmission	Personnel should be familiar with hygiene procedures. This knowledge may be gained through sufficient field experience and/or consultation of literature. Estimated total time in field: Min 1 year involved in similar projects.
Animal handling and processing	Experience in handling	Personnel should be confident at handling and restraint of the range of

Competency category	Competency requirement	Competency assessment
skills/experience	terrestrial fauna	species likely to be captured. Personnel should be able to correctly identify the likely species to be encountered in pitfall traps in the area. This knowledge may be gained through sufficient field experience and/or consultation of literature. Estimated total time in field: Min 1 year involved in similar projects.

8 Occupational Health and Safety

Always carry a first aid kit in your vehicle and be aware of your own safety and the safety of others as well as the animals when handling.

A job safety analysis is recommended prior to undertaking any monitoring which involves hand capture. This safety analysis should include the following considerations.

8.1 Animal bites, stings and scratches

Venomous snakes can be lethal. Personnel with appropriate first aid training and experience identifying and treating snake bites must be present where there is a risk of venomous snakes in the trapping area. Spiders, scorpions and other invertebrates may also be disturbed when checking funnel traps and can inflict irritating stings or bites. All inflicted injuries (even superficial ones) should be appropriately treated as soon as possible to ameliorate possible allergic reaction, prevent infection and promote healing.

To improve safety, field personnel should be aware of the treatment for snakebite and carry appropriate pressure bandages. Personnel should also have up-to-date tetanus vaccinations. Department personnel must not capture bats unless fully vaccinated against Australian Bat Lyssavirus.

If Department personnel or volunteers are injured, please refer to the Department's Health and Safety Section's 'Report a Hazard, near-miss or incident' intranet page, which can be found at http://intranet/csd/People_Services/rm/Pages/ReportingHazards,Near-MissesandIncidents.aspxZoonoses.

8.2 Zoonoses

There are a number of diseases carried by animals, including ticks, that can be transmitted to humans (i.e. zoonoses such as Toxoplasmosis, Leptospirosis, Salmonella). All personnel must take precautions to minimise the risk of disease transmission to protect themselves, their families and wildlife populations.

Advice on minimising disease risk is contained in the Department SOP for *Managing Disease Risk in Wildlife Management.*

8.3 Allergies

People with or that develop severe allergies associated with animals or animal materials should consult with their medical practitioner on appropriate precautions and actions for the handling of wildlife.

9 Further Reading

The following SOPs have been mentioned in this advice and it is recommended that thye are consulted when proposing to use dry pitfall traps.

- Department SOP *Animal Handling and Restraint using Soft Containment*
- Department SOP *Hand Restraint of Wildlife*
- Department SOP *First Aid for Animals*
- Department SOP *Humane Killing of Animals under Field Conditions*
- Department SOP *Managing Disease Risk in Wildlife Management*

For further advice refer also to:

Environmental Protection Authority and Department of Environment and Conservation (2010) *Technical Guide - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (Eds. B.M. Hyder, J. Dell and M.A Cowan). Perth, Western Australia.

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11 Glossary of Terms

Animal handler: A person listed on an application to the Department's Animal Ethics Committee who will be responsible for handling animals during the project.

Drift fence: A length of short fence which runs across the centre of the pit(s). Animals encounter the fence and follow it to the pitfall. Pitfall traps can be set up with or without drift fences. A drift fence increases the probability of capturing animals.

Pitfall trap: A hole in the ground in which a plastic bucket or PVC tube is placed so that the lip of the bucket or tube is level with the ground surface. Animals fall into the trap and cannot get out due to the unscaleable surface and the depth of the bucket or tube. Pitfall traps are most useful for invertebrates, small mammals, frogs and reptiles.