



CONDUCTING FAUNA SURVEYS

a guide for landholders or community groups.

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INTRODUCTION TO BIODIVERSITY SURVEYS



Biodiversity surveys are a critical part of measuring the success of land management practices over a period of time. While each survey provides a low-resolution snapshot, over time such surveys can build up a detailed picture of the fauna and flora and how these are influenced by different land management practices. Surveys can paint a picture of the fauna associations with different plant communities, soil types, burning regimes or stocking rates. They can alert land managers to changes brought on by climate change or invasive species and have the potential to contribute massively

to our understanding of the Australian biota. However, if fauna surveys are to be meaningful, they must be carried out regularly, they must gather quality data and they must be replicable.

This manual has been created as a guide for landholders and community groups wanting to undertake their own surveys in a manner that gathers quality data and provides a basis to build on their knowledge.

In NSW all native vertebrate fauna is protected.

LEGAL STUFF

In NSW all native vertebrate fauna is protected. Handling or harassing wildlife, even picking up wildlife products such as feathers, is technically illegal. Trapping and/or handling requires further permits from an Animal Ethics Committee. Therefore, non-invasive methods simplify fauna surveys, and although the surveys will not be as comprehensive, they will nonetheless give participants the opportunity to assess the wildlife on their property. By not handling or interfering with wildlife on the property you can eliminate a lot of paperwork, risks to people and risks to wildlife. The down-side is that there are some groups of animals that need close examination in the hand to be identified with certainty, and these will not be included.





Survey sites to be established on the basis of the following considerations.

- Access. How easily are sites accessed under different weather conditions?
- Size of habitat patch. Is the patch of habitat large enough in area to contain the site fully and be representative of that vegetation/habitat type?
- Is there a similar, accessible vegetation type that can be sampled to be a control to compare impacts of different land management regimes?
- Regional importance of habitat type. Is the habitat under threat? Is it the known habitat of threatened species? Is the habitat significant for other reasons (eg. short-range endemics, unique environment, threatened ecological community)?
- Replication of sites in the same habitat type over time will build up a picture of the animal and plant associations of that habitat. Creating a herbarium and practicing identification of common plant species will assist surveyors in identifying areas of similar habitat suitable for replicated sampling. Over time the replication of sites that have similar plant and animal communities can be especially useful in the study of the impact of fires or particular management regimes.
- Give each site a unique identifying name and record it on a tag on-site. Monitoring sites should be marked with star pickets or be identifiable by some other permanent feature. Recording this information in a GPS and on hard copy is important.
- Survey sites should ideally be placed at least one kilometer apart to avoid “cross-contamination” of sightings (recording the same animals in the both sites), but this also depends on what you hope to achieve.

Surveys could take place at any time of year, depending on targeted species. However, comparative surveys should be undertaken at the same time (preferably under

the same conditions) in following years. Reptiles are best surveyed in the warmer months, frogs best surveyed following seasonal rains, owls are best surveyed using call playback in winter. Many bird species are seasonally migratory, so winter and late spring surveys can be carried out, and some frog species only call in the cooler months.



Each survey site should receive the same amount of survey effort. For example:

- Each survey sites should encompass the same area, eg. 1 ha. (100m x 100m)
- Riparian sites can be linear, eg. 20m x 500m to stay within habitat type
- 3 x 20 minute bird surveys (total one person hour) on each site, using binoculars. Surveyors should also have access to a device with a bird call app.
- One person-hour spotlighting on each site
- One person-hour active searching during the day at each site, preferably when temperatures are suitable for reptile activity. Active searching should include scanning suitable habitat with binoculars and disturbance to habitat should be minimised.
- If camera traps are available camera traps should be deployed on animal paths or likely pathways. Care should be taken to set them in such places where moving vegetation will not trigger them. A scent, such as fish oil, or bait station may be used to “bait” camera traps. Camera trap localities should be logged for retrieval. Traps are set for “feral animal monitoring” because using camera traps for wildlife monitoring is technically illegal without Ethics Committee approval.
- Reference photographs should be taken at each site from the same place looking in the same direction on subsequent surveys. A star picket may be used to mark photopoints.

IMPORTANCE OF DATA INTEGRITY



The integrity of the data gathered during a fauna survey is critical for monitoring, and standardised techniques allows replication of methods and statistical analysis of results later on down the track. Without standard techniques, the data loses its value and becomes merely points on a map. With comprehensive site descriptions including precise position information, replicated surveys can build up a comprehensive picture of landscape changes over time. No fauna survey will ever be complete- some animals may have larger territories or home ranges than the survey site and may only venture into the site on occasions.

Others may only be present at low numbers and may therefore be virtually undetectable.

 **Data integrity is critical to the long-term success of a monitoring program.**

- The start times, names of participants, camera and tablet number and weather conditions should be recorded for all surveys.
- ensure all digital devices, including tablets, GPS, camera traps and cameras are synchronised to the correct date and time. Each memory card should have its own unique ID so its use can be tracked.
- In a community group, participants should be familiar with what they have to record and who is responsible for recording what. These tasks should be delegated at the beginning of each survey.
- Ensure that all participants have a notebook and that data is collected and collated at the end of each day. Notebook pages can be photographed at end of each day for backup.
- When taking photographs of sites or animals, record the photo number and device number. This will make cross-referencing photographs easier.
- If possible, establish control sites to be used for comparative purposes against management regimes eg burnt/unburned or active/passive pest control.
- Create a “Survey Checklist Template” - this should be kept with the person in charge of the survey and filled in as the survey progresses to make sure all tasks are completed

PASSIVE SURVEY TECHNIQUES

CAMERA TRAPS

Camera traps have a number of advantages for long-term wildlife surveying- they are basically “leave and retrieve” devices that are unobtrusive and can gather information on animals that may otherwise be invisible in the landscape. There have been many significant discoveries of rare species made on camera traps. They are also useful for detecting and monitoring feral animal activity on a property so can be used to look at bait take on baiting programs to ensure that the targeted species are being poisoned.

WHAT TO LOOK FOR IN A CAMERA TRAP.

Camera trap technology has come a long way. You want a camera with a fast trigger speed, a low or zero-glow flash, and one that has good support in Australia if something goes wrong. Reconyx are regarded as the “Rolls Royce” of camera traps, but are pricey. The Swift Enduro series are also well-regarded by wildlife researchers. More megapixels isn’t necessarily better, a lot of cameras use extrapolation to produce large images from a small sensor, and this doesn’t necessarily produce good results. In the authors experience Varta rechargeable batteries will deliver long battery life in a camera trap.

When setting Camera Traps

- Check battery level and card compatibility prior to heading bush
- Ensure date and time are accurately set when camera is set
- Ensure location of camera trap is recorded on GPS so camera can be found.
- Ensure that camera is set in a position where motion-sensitive camera is unlikely to be triggered by moving branches or growing grass. You may want to trim vegetation likely to wave in front of the sensor.
- Camera traps pointing south are more likely to have clear images as they won’t be subjected to sun shining into the lens.

- Ensure camera is out of sight of the public if possible. Camera traps are expensive and desirable objects and prone to theft. If using a visible flash, make sure it is pointed away from public access.
- Look for likely animal pathways to increase chances of photographic captures
- Traps can be baited with scent to increase the likelihood of animals loitering in the photographic zone allowing photographs from different angles to aid in identification of species or individuals.

When checking Camera Traps

- Always copy whole photo folders onto computer hard drives with camera number and location in the file name.
- Do not delete photos from camera traps if they have only been checked on the camera; small animals may not be obvious on small screen. Check camera trap images on a large computer screen.

LISTENING DEVICES

Dedicated listening devices such as the Song Meters are relatively expensive (around \$865) but have the advantage of being able to be left unattended for long period of time. (There are also laws about where they can be used). The recordings produced are attached to a time stamp. The disadvantage of these devices is the difficulty of analysis, which takes a certain level of expertise. There are also bat detectors available for smart phones, but at between \$300 - \$550 the cost of the ultrasonic microphones may be prohibitive to the general public. (You might also need adaptors to fit your phone). However, smart phones can be used with certain apps such as RecForge (for Android) or R DE Rec (for iOS) (though iTunes, about \$10) to record frog calls and bird calls. An external mic can be picked up for about \$75. Good quality digital recorders can be purchased for about \$200. Frog calls can be uploaded for ID through the FrogID app made by the Australian Museum.



DAYTIME REPTILE SEARCH

- Only carry out searches when reptiles are likely to be active; avoid extremes of temperatures (ideal is between 20-30°C).
- Scan for reptiles with binoculars on rocks, logs and branches when they are likely to be basking in the morning or late afternoon - best to approach survey site with sun on your back.
- Preserve habitat while searching using techniques such as looking for geckos by torch at night rather than tearing bark from dead trees; assess whether a rock can be easily replaced to its exact original position before attempting to lift it; if you cannot move a rock or log safely, don't move it at all.
- Use your ears to listen for movement.
- Use a torch or reflected sunlight from the face of a phone to check hollows and crevices.
- Record date, time and temperature of active search and confine it to one person-hour per search (ie. 2 people= 30 mins, 3 people= 20 mins, 4 people= 15 mins).

if you cannot move a rock or log safely, don't move it at all.

SPOTLIGHTING SEARCH ON FOOT

- Prepare prior to heading into the field with torches, battery chargers, spare batteries of appropriate size, tablets, notebooks, cameras, Kestrel weather meters, 1st aid kit and any necessary navigation equipment such as GPS and compass. Have a communication plan so that if you don't return, searchers can find your body.
- It is very easy to become disorientated in the dark. Prior to entering each site, create a waypoint of the vehicle location on the GPS that will be carried with the surveyors.
- Be careful to avoid injury while walking towards eyeshine. This is especially important when using a red LED torch as you lose your peripheral vision.
- If you have mine shafts on your property make sure these are marked and are avoided.
- Commence search immediately after dark to ensure greatest chance of encountering geckos.
- Place torch as close to line-of-sight to ensure eyeshine will be picked up, but not immediately near eye to avoid being injured by insects attracted to the light (although using a red LED will avoid this hazard).
- While spotlighting, "paint" trees with the light, moving from the base of the trunk up each major branch to ensure tree is completely searched.
- Listen for animals moving through foliage, leaf litter or the sound of falling bark as an extra means of location animals.
- Try to avoid disturbing day birds while spotlighting, as disturbed birds may take flight and fly blind, consequently injuring themselves or falling prey to feral cats.
- Record date, time and temperature of active search and confine it to one person-hour per search (ie. 2 people= 30 mins, 3 people= 20 mins, 4 people= 15 mins).

ROAD TRANSECTS USING VEHICLES

Road transects should be along identifiable stretches of road and undertaken at no more than 40 km/h, preferably on cloudy or moonless, humid nights. Times should be noted and start and end points of transect should be marked on GPS. It is important to note what should be included and how far from the road the survey should include, and that this should be consistent through subsequent surveys. The difficulty with going further off the road is that you will only get records of those species with brighter eyeshine, missing the reptiles and frogs that would be obvious on the road as they will be hidden by vegetation and ground cover. For this reason, road transects should only include the road itself and immediate verge, otherwise they should be called spotlight transects.

- Travel between 20-30km/h, the optimum speed for seeing small creatures on sealed road. On unsealed roads the speed should be reduced.
- Use high-beam and driving lights while conducting road transects, but always be mindful of other road users and dip lights when stopping for wildlife.
- For safety, ensure a traffic spotter is designated; wear hi-vis clothing and activate hazard lights when stopped.
- Note that many nocturnal animals are tiny, the size of leaves.
- Make sure head torches are worn to leave two hands free for photographing animals on the road.
- Only record species on road or on the immediate verge.
- Road transects can be used to record road kill as well; your daily commute could be used to assess populations of animals if you can safely identify the species.



BIRDWATCHING

- Ideally, surveyors should have access to field guides, binoculars, bird ID apps and a camera with a telephoto lens. A spotting scope is recommended for use at waterholes, floodplains and wetlands.
 - Undertake surveys at times that birds are most likely to be active, early in the morning and late in the afternoon.
 - Talking during bird surveys should be kept to a minimum.
 - Use bird identification Apps to help learn to associate calls with species.
 - Sound recording devices can be used to record calls during the survey. Always state date, time and locality on the sound recording.
 - Call playback may be used to confirm species identification, but it is recommended the Birdlife Australia Ethical Birding Guideline be followed.
- <https://birdlife.org.au/documents/POL-Ethical-Birding-Guidelines.pdf>**
- To properly observe birds, surveyors should approach area to be surveyed with the sun behind them.
 - Learn to recognise alarm calls to help locate birds of prey.
 - Record date, time and temperature of bird search and confine it to 20 mins of person time.
 - Bird surveys may also be carried out at artificial watering holes and bird baths.
 - A bird list for the property can be maintained and updated. This is a great way to familiarise yourself with common birds and rarer visitors.



SAND PADS

- Sand pads are strips or patches of sand that cross roads or paths. They can be raked or swept in the late afternoon so the tracks of animals can be observed the following morning. With experience, many species of animal can be detected through tracks and signs. A stick laid perpendicular to the track on either side of the pad can encourage animals to jump into the middle of a pad as they

pass over it. Sand pads can be smoothed with a hessian sack and should be examined when the sun is at a low angle in the morning or late afternoon (or at night with a torch at a low angle). Sand pads should be established around bait stations as well. They can be used in conjunction with camera traps to identify who left what track.

ARTIFICIAL SHELTERS

- Creating artificial habitat for reptiles using sheets of tin and/or roof tiles can be another means of monitoring populations over time. For example, laying out ten sheets of tin in a permanent survey plot means that the tin can be turned under similar conditions to locate reptiles that may be using the habitat. As many species of reptile only use such

habitats within certain environmental conditions, picking the conditions in which to survey becomes important for replicability. The best time to check is when reptiles are going to be under the tin to gain warmth, but before the tin gets so hot that they can retreat at lightning speed before being identified.



IDENTIFICATION OF ANIMALS



Identification of different species amongst the different animal groups is an art that takes a long time to master, and practice is essential. Learning how to identify a range of animals in the field or from camera traps is challenging for anyone, and the language used to describe the identifying characters can be baffling for a novice. It is impossible for anyone to learn to be a wildlife expert in one day, but it is hoped that the training provided will provide the participants with the skills to know what to look for and the enthusiasm to encourage the use of field guides. Some groups of animals such as bats are pretty well impossible to identify without having them in the hand, and because of the specialist equipment and permits required to collect them, will not be included in this course. Having field guides and studying the key differences in similar species found in the area to be surveyed prior to entering the

field will make the process of identifying animals a little quicker, reducing stress to the animals and the necessity of handling. Compiling lists of species that may be encountered in the areas to be surveyed from field guides and reports from earlier surveys allows surveyors to look for the specific identifying features of those animals when they are found. It is important that surveyor learn the parts of animals used to distinguish them from other species, such as the names of the different scales in reptiles, the different parts of a bird, and those characteristics used to identify mammals. Without this knowledge, accurate identification becomes difficult, and the value of a biodiversity survey is rapidly diminished. It may be worth engaging a professional ecologist to assist you with or co-ordinate surveys. They will have the necessary skills, equipment, permits and licences to find a larger number of species.



Figure 1: Head Scales of a lizard

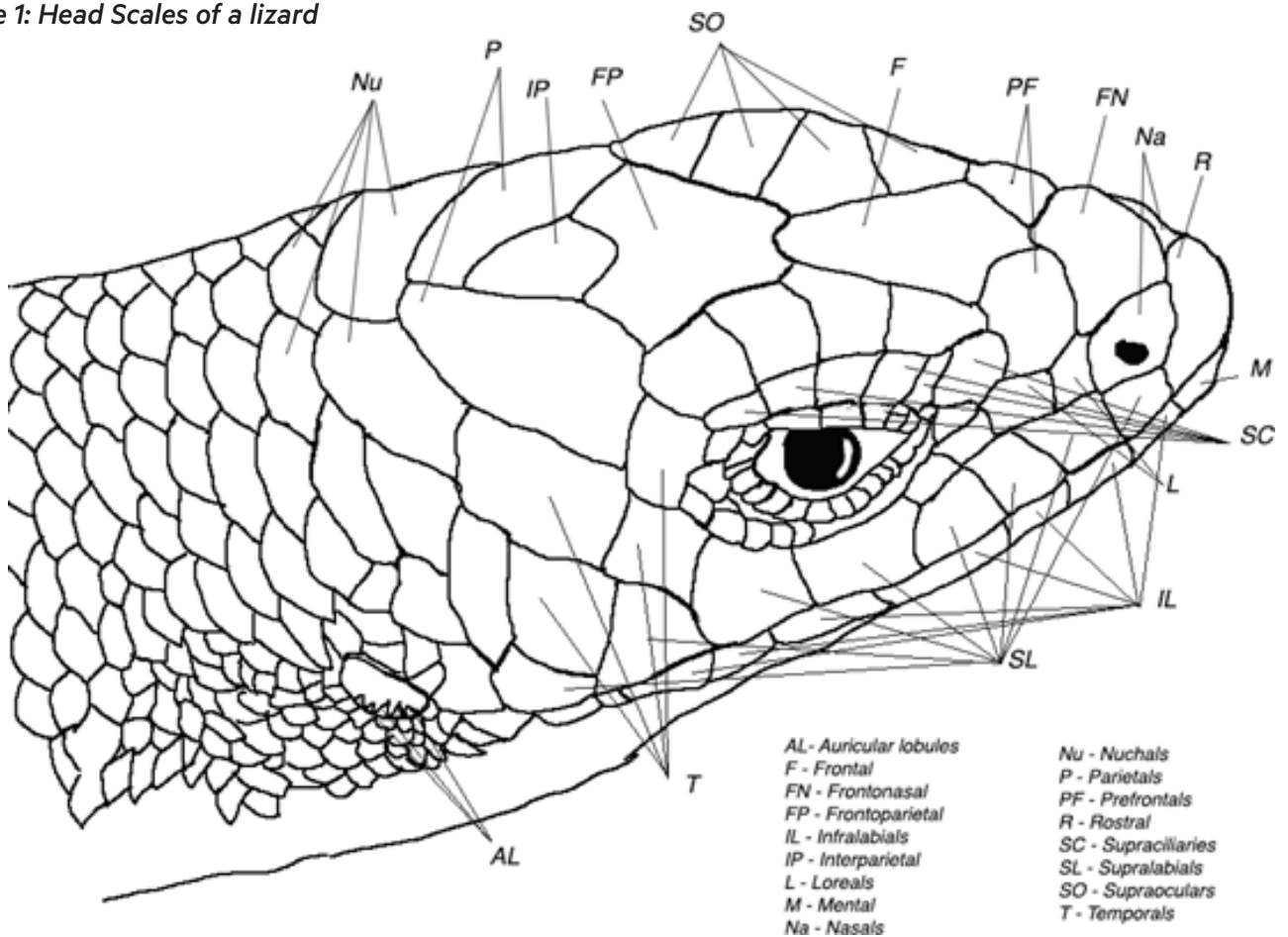
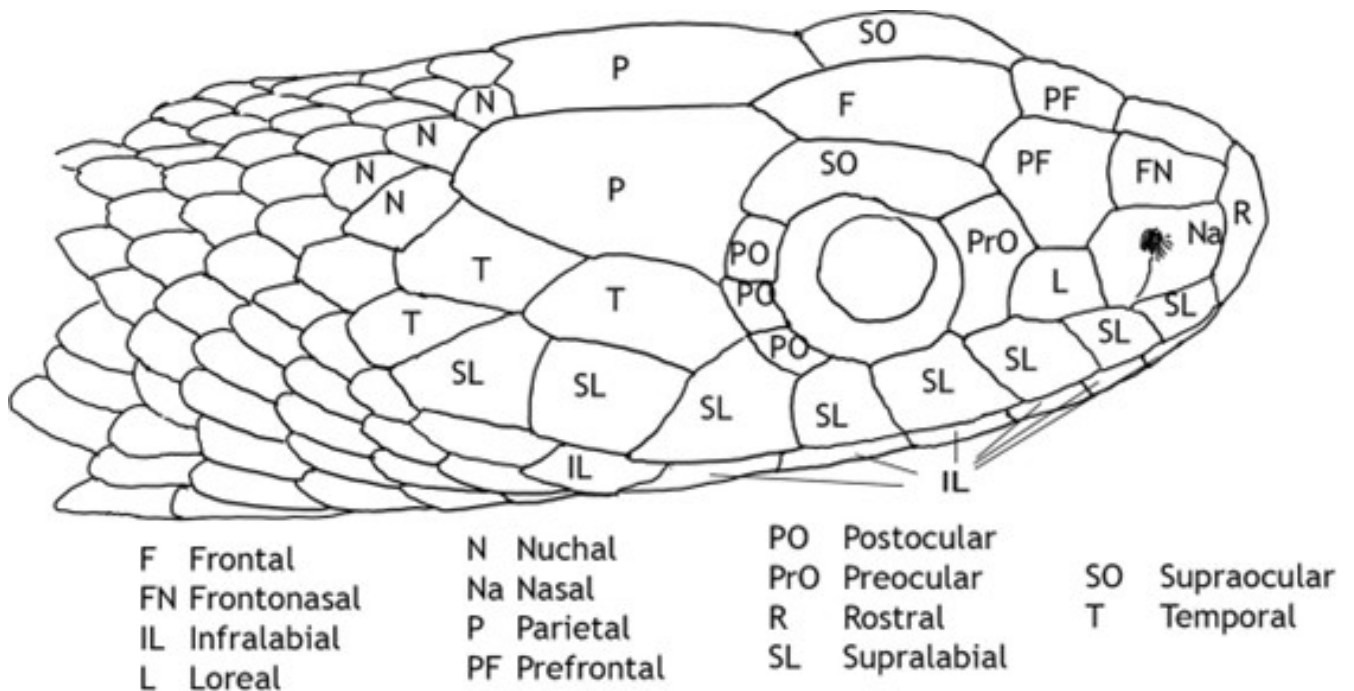


Figure 2: Head scales of a snake





There are a number of Apps that are useful for identifying fauna, but unfortunately there is no comprehensive App for Australian Mammal identification.

APPS

FrogID Australian Museum iOS or Android; An excellent citizen science App with calls and photographs, and the facility for uploading frog calls for later identification.

Frog Croaker Phil Spark iOS & Android. This app Covers Namoi catchment, and includes calls and photographs. Most frogs from the Gwydir Shire included.

Reptiles Guide iOS only. This is the 2014 edition of A Complete Guide to Reptiles of Australia by Steve Wilson & Gerry Swan, so it is not quite complete or as up to date as the latest edition of the hard-copy book.

Snakes of Australia Ug Media iOS. Excellent. Comprehensive and location aware.

Frogs of Australia Ug Media iOS. Excellent. Comprehensive, location aware, includes calls.

The Micheal Morcombe eGuide to Australian Birds Android & iOS. A bit pricey (\$29.99) but worth it. Includes calls, including those from different races.

Sightings Ug Media iOS. Works with GPS-enabled iphones and iPads. Contains a pre-loaded list of Australian vertebrates. Direct entry of wildlife records into a spreadsheet that can be emailed to your desktop.

BOOKS

The following field guides are recommended:

A Field Guide to the Mammals of Australia Third edition by Peter Menkhorst and Frank Knight. Oxford University Press

Field Companion to The Mammals of Australia. Steve Van Dyk, Ian Gynther and Andrew Baker (eds). Reed New Holland

Australian Bats (Second edition) by Sue Churchill. Jacana Books, Allen & Unwin

The Field Guide to the Birds of Australia (Ninth edition) by Graham Pizzey and Frank Knight. Harper Collins

The Australian Bird Guide by Peter Menkorst, Danny Rogers, Rohan Clarke, Jeff Davies, & Peter Marsack - the most recent field guide available on Australian birds.

A Complete Guide to Reptiles of Australia (sixth edition) by Steve Wilson and Gerry Swan 2019. Reed New Holland.

A Field Guide to Reptiles of New South Wales (Third edition) by Gerry Swan, Ross Sadlier and Glenn Shea 2017. Reed New Holland, Chatswood.

Tracks, Scats and Other Traces A Field Guide to Australian Mammals Barbara Triggs 2004 Oxford University Press South Melbourne

Photographic Field Guide to Australian frogs. Mark G. Sanders 2021, CSIRO

Australian Soil and Land Survey Field Handbook
Second edition R.C. Macdonald, R.F. Isbell, J.G. Speight,
J. Walker and M.S. Hopkins 1990 Inkata Press

Monitoring Threatened Species and Ecological
Communities Sarah Legge, David Lindenmayer, Natasha
M. Robinson, Benjamin C. Scheel, Darren M. Southwell &
Brendan C. Wintle (eds)

It should be noted that while each of these field guides have their own merits, they are not necessarily consistent in the characters that are used to define each species- in fact in some cases they are almost contradictory.

It is impossible for anyone to learn to be a wildlife expert in one day, but it is hoped that the training provided will provide the participants with the skills to know what to look





It is inevitable that unfamiliar animals will be encountered. Good-quality photographs can be used to identify an animal later, or be shared on-line with groups of experts. Unfortunately, good-quality photographs generally require at least medium-quality equipment and a level of photography skills (although you may be able to get away with poor quality equipment and a lot of luck). As a general rule when photographing smaller animals a macro lens is almost critical, but thankfully camera phones have come a long way and these and most point-and-shoot cameras usually have a macro function (denoted by a flower or magnifying glass).

It is recommended that people practice using different settings to familiarise themselves with how controls affect the photographs. It is strongly recommended that people who want to take useable photographs read the manual that came with their camera and practice different types of photography prior to embarking on a survey in which they may be called upon to photograph animals.

When shooting close-ups on an interchangeable-lens camera with manual capacity put the camera on manual (M) on the dial, adjust the shutter speed to the flash sync speed (usually about 1/200 sec, set the aperture to F16 and use the flash. Make sure the exposure compensation (+/-) is set to zero. If using a macro lens set as close as practical to the animal so it nearly fills the viewfinder but still in focus. It is a good idea to delete out of focus photos so the SD Card doesn't fill up. The macro lens can also be used to photograph reptiles if they are carefully approached, but for larger reptiles, birds, and many mammals a telephoto lens is more suitable. When using a telephoto lens, set the camera to program (P) and set the ISO on 800. If shooting birds against the sky or a bright background, set the exposure compensation (+/-) to +1.

The Olympus TG-5 is an all-weather "tough" camera that has an excellent macro function & GPS built in, but smart phone camera technology is such that even invertebrates can be photographed with a modern phone.

WHAT TO PHOTOGRAPH

For all small terrestrial animals photographed a photo from above that shows the general characteristics including the full tail length can be important. Using a familiar object in the photo for scale (eg. a battery, pen, or a coin tails side up) can be very useful in the identification of a number of animals. Below is a list of photos to aim for, although the chances of getting photos of these features without handling the animal are not great.

Mammals: full body, including tail; side of head, soles of feet.

Lizards: whole body photo from an angle of about 45°. Include a close up of the head if possible.

Snakes: Full body, close up of head if safe to do so.

Frogs: Full body photograph from slightly above. Soles of feet can be important.

Birds: Side on is best; birds of prey are best photographed with wings and tails spread.

In the absence of a photograph, contemporaneous notes and a rough sketch can be useful.



CONSUMABLES


- Rolls of pink flagging tape
- 2 x permanent marking pens for writing on flagging tape (it is almost inevitable that you'll lose one) Spare AA batteries for GPS and camera traps
- Bait for bait stations - peanut butter and rolled oats (quick oats are best) and chicken drumsticks. Scent for camera traps (fish oil, vanilla essence etc)
- Ball-point pens for taking notes.



NON- CONSUMABLES

- Notebooks
- Smartphone or Tablet with date and time set and GPS switched on, bird apps and "sightings" if iOS.
- GPS (or good GPS App on the Tablet or Smartphone)
- Interchangeable lens camera with macro lens and telephoto zoom with date and time checked and batteries charged. Camera cases should include blower brush, lens tissues and lens caps.
- Field hand lens (geologists loupe)
- Compass
- Field first aid kit
- Binoculars
- Torches, including head torches. The best torch for wildlife spotting the author knows of is the Wolf-eyes X beam with the optional ProCap. This torch has a red LED and an adjustable beam, making it excellent for spotting frogs at a distance. It is however an expensive and desirable item.
- Kestrel weathermeter for measuring temp/windspeed and relative humidity.
- Camera traps with date and time set.
- Star Pickets for marking sites if permanent sites and photo points are being established.

WHAT TO RECORD

 Recording quality data is essential for effective monitoring, as it is what allows comparisons and replication.

What you record on-site depends very much on what you want to do with the data, but commonly recorded site information includes:

- Location
- Site corner co-ordinates: (4 corners)
- Map datum: Note whether using GDA, AGD94 or WGS84 (default for most GPS units).
- Date and time of survey and survey duration
- Names of surveyors
- Type of survey: (eg. Bird, spotlight, frog, reptile, invertebrate)
- Species and number of each recorded
- Site number recorded with photo number
- GPS location of photograph (may be recorded automatically by many smart phones/cameras if location is turned on)
- Dominant tree species and estimated crown density
- Number of hollow branches within 10m radius of site centre
- Number of logs greater than 10cm diameter on ground within 10m radius.
- Soil type
- Soil depth
- Leaf litter depth and % coverage.
- Estimated time since last fire:
- Disturbance from other factors such as grazing, feral animals etc.
- Weather conditions during survey-temperature, cloud cover (%) wind speed (Beaufort Wind Scale), relative humidity during survey.
- Moon phase during spotlight surveys as this may influence animal activity.



USEFUL LINKS:

iNaturalist: Allows you to upload photographs of animals and plants and contribute to citizen science projects. <https://www.inaturalist.org/>

Bionet: NSW Government atlas of flora and fauna records. <http://www.bionet.nsw.gov.au/>

Atlas of Living Australia ALA): <https://www.ala.org.au/> Note that ALA records are not as carefully vetted as Bionet so there may be dubious records included. Including “ALA” in an internet search with the name of the species will usually bring it up.

Australian code for the care and use of animals for scientific purposes 8th Edition 2013: <https://www.nhmrc.gov.au/about-us/publications/australian-code-care-and-use-animals-scientific-purposes#block-views-block-file-attachments-content-block-1>

Binoculars and telescopes: <https://procular.com.au/how-to-choose-binoculars/> Camera reviews and buying guides: <https://www.dpreview.com/>

Kestrel Weathermeters: <https://kestrelmeters.com.au/>

Recommended spotlighting torch: <https://wolfeyes.com.au/xbeam-red-green-led-hunting-torches> - listed as XBeam RED LED Photography Torches - RED 620nm + Procap - Best for Wildlife, Photography and Zoos (a bit pricey but switches between red and white LED and comes with a rechargeable battery good for a full night of spotlighting).

FACEBOOK GROUPS FOR ANIMAL IDENTIFICATION:

(Unfortunately, you need to join Facebook to participate).
Australian Reptile/Amphibian Identification

Australian Mammal Identification
Australian Bird Identification
Entomology Australia “Invertebratology”
Australian spider identification page

Or if you have a photo of an animal you need identified you can email the author at alexander@faunaverse.com.au or message me on 0427489081.