Standard Operating Procedure

SC23-01 VOUCHERING VERTEBRATE FAUNA SPECIMENS

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*.

Version 1.2

June 2023

GOVERNMENT OF WESTERN AUSTRALIA

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Approved by the DBCA Animal Ethics Committee:

Martin Dziminski DBCA

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Dr Martin Dziminski

Chair, Animal Ethics Committee

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Contents

1 Acknowledgements

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2 Purpose

Vouchering involves the retention of one or more representative specimens or samples collected during a field survey and their submission to the State's collection for later verification of identity by a taxonomic expert, usually located within a museum. The reasons for vouchering are many and varied, but the retention and lodgement of a voucher is primarily for the purpose of providing a permanent record of what was caught at a specific location at a specific time. Vouchers also tie all scientific results to a specific, preserved specimen that can be consulted for correct identification, morphology, locality, ecology and environmental associations. Vouchers are essential for clarification of unexpected results or in the interpretation of variation in morphological or other data and prevent misidentification. As such, vouchers are the basis of reproducibility, an essential part of the scientific method.

This Standard Operating Procedure (SOP) provides advice on preparing for fieldwork involving collecting and vouchering fauna, deciding when to take specimens, how to prepare and preserve specimens, how to transport specimens, and how to lodge specimens for formal identification with the Western Australian Museum (WAM).

3 Scope

This SOP has been written specifically for scientific and education purposes, and endorsed by the Department of Biodiversity, Conservation and Attractions' (DBCA) Animal Ethics Committee (AEC). However, this SOP may also be appropriate for other situations.

This SOP applies to all fauna survey and monitoring activities involving vouchering of vertebrate fauna specimens undertaken across Western Australia by DBCA (hereafter department) personnel. It may also be used to guide fauna related activities undertaken by Natural Resource Management groups, consultants, researchers and any other individuals or organisations. All department personnel involved in fauna research and management should be familiar with the content of this document.

Projects involving wildlife may require a licence/authorisation under 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 *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 in wildlife studies and should be referred to for all AEC approved projects. A copy of the code may be viewed by visiting the National Health and Medical Research Council website (http://www.nhmrc.gov.au).

4 Animal Welfare Considerations

To reduce the level of impact of vouchering fauna specimens on the welfare of animals, personnel 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 vouchering, 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 the vouchering of fauna specimens will require approval from the department's Animal Ethics Committee.

The key animal welfare considerations that should be considered when vouchering fauna specimens are listed below and are highlighted throughout the document.

4.1 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. Adhering to the guidance in this SOP will assist in minimising the likelihood of adverse events. 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 *Euthanasia of Animals Under Field Conditions*. Where disease may be suspected, refer to the department SOP for *Managing Disease Risk and Biosecurity in Wildlife Management* for further guidance.

4.2 Level of impact

The impact of vouchering fauna is high. Potential animal welfare impacts when vouchering fauna specimens include:

- Distress (caused by capture, handling, discomfort, social isolation, separation of mother and young).
- Trauma (injury to the animal during capture and restraint).

It is important to justify any impact on animals, especially those being euthanased. All alternatives for collecting the necessary data should be considered before vouchering (see Section 5.5.5).

It should be noted that whilst these impacts are specifically associated with vouchering, an animal may also experience other impacts from associated procedures. Investigators must be aware that the effects of a series of stressors, such as trapping, handling, transportation, and sampling are cumulative.

5 Procedure Outline

Consultation with a museum or similar institution must take place before collection to ensure the use of proper preservation and holding techniques, the availability of necessary equipment and the collection of essential data (National Health and Medical Research Council, 2013). Consultation with WAM personnel is imperative prior to vouchering to ensure only species of interest are collected and

to avoid unnecessary vouchering. Other institutions/experts may also be consulted, where appropriate, as there might be project or species-specific requirements for vouchers additional to those of the WAM.

The WAM can provide guidance on how many specimens should be collected from a particular site over a particular time period.

Depending on the study area, guidance from the WAM may be sought on target taxa or groups where specimen vouchers are required either because of poor scientific knowledge, taxonomic uncertainty, poor representation in the collections or through project design (species-specific projects).

WAM Contacts (as of June 2023):

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5.1 Preparing for the field work involving collecting and vouchering

Preparation is essential for the collection and vouchering of fauna specimens. Preparation ensures that specimens are of use and have value so that unnecessary collecting and vouchering is avoided.

Aspects to consider prior to collecting in an area of Western Australia include:

1. What species are likely to occur in the area?
2. What are the existing collections of specimens from the area?
3. Are there species of particular taxonomic interest within this area?
4. Are there other researchers who have a specific interest in specimens, tissue and or records from this area?
5. Do I have the appropriate equipment, time, training and personnel to either prepare or deal with specimens adequately?

5.2 Obtaining a list of species

A list of species enables you to plan what species to target, what survey techniques are likely to be most suitable and to become familiar with identifying the species that may be encountered. Sources of such information include literature, experts, naturalist groups and databases. Databases are the most efficient method of quickly generating a species list for an area.

WAM vertebrate specimen records will be available through the Biodiversity Information Office (BIO), an alternate source is the Atlas of Living Australia. For information on threatened or priority fauna species, you can request a search of the department's Threatened and Priority Fauna Database by contacting the Species and Communities Program.

5.3 Familiarity with identifying species

Field workers, particularly those working in a new area, are encouraged to contact the WAM to review existing specimen material. Existing specimens from a survey area will provide the knowledge of what species to expect and the characteristics that can be used to identify them.

It is recommended to carry copies of relevant field guides or identification keys to facilitate easy identification of species. Field guides inform the expected distribution and habitat; colour and marking variations through sexual dimorphism, age or breeding; and to morphological differences within geographic regions, where known. Personnel should be familiar with working through keys, maps and photos in field guides, where these are available and sufficiently comprehensive, and keep up to date with published scientific literature.

5.4 Gathering required equipment

Suitable equipment must be available to prepare, store and transport specimens. This involves obtaining suitable preserving solutions and suitable storage containers (Section 8). Depending on which species are likely to be collected/vouchered, different equipment may need to be obtained.

5.5 Deciding when to take specimens

Knowledge of what species should be vouchered, from where and how many, is essential to making informed decisions when collecting voucher specimens. When deciding whether or not to take a voucher specimen, the following should be considered:

5.5.1 What level of reliability is required?

Accurate identification of taxa in the field is preferable, so that individuals can be released at the point of capture and the minimum number of specimens is vouchered. However, for many groups, field identification is difficult, even when held in the hand, and vouchering provides an option for accurate identification. Visiting the WAM collections is a good start to getting to know the potential fauna likely to be encountered in any particular area. This knowledge, when combined with experience in the field, and training, contributes to a good working knowledge of the fauna. With some taxa, the taxonomy is so poorly understood that a voucher specimen is the only option for accurate identification. In addition, identification in the field may be so difficult that close examination of features (e.g., skull morphology) not accessible on live specimens may be required.

Where an unusual specimen is collected in the field, it should first be compared to other similar species, in the hand where possible, to confirm if it is indeed unusual. Examination of up-to-date field guides may support suspicions of an unexpected range extension for a species, or a taxonomic anomaly. In both cases, a specimen voucher would be potentially valuable.

The highest level of reliability of identification is possible only with a voucher specimen and its associated tissue. A high level of confidence may be required if legal issues are involved, or major land management decisions are dependent on accurate identification.

Note: Although providing the WAM with a voucher might be the best option for accurate identification, this is not guaranteed. There are some taxonomic groups that are complex and cryptic, for which accurate identification remains unresolved. Resolution for many of these may be some time away as more material and further genetic analysis is required.

5.5.2 What is the state of taxonomy of the group?

Only specimen-backed records can be reassessed in the event that the taxonomy of a group is modified. For some taxa, the current taxonomy is so poor that a sighting or capture record will be meaningless in the context of future taxonomic assessments, and the collection of additional voucher specimens and/or tissue samples will contribute to improve the taxonomy.

5.5.3 What is the abundance and distribution of natural populations?

The more specimens of a species collected from a study area, the greater the amount of information on abundance and distribution they can provide. A series of specimens will provide information such as the degree of variation in appearance, comparisons between age and sex, and variation in reproductive state. A series is preferred if the specimens potentially represent a new taxon. However, the more specimens collected, the greater the potential impact on the population.

The negative impact on the natural population is one of the arguments against the taking of voucher specimens, and this may apply in some circumstances. Taking a small number of voucher specimens will usually have little to no impact on the natural population. The situation should be judged on a case-by-case basis, weighing up factors such as the estimated population size, breeding frequency and fecundity. A general rule of thumb for smaller, more cryptic taxa is that if specimens can be found without too much effort, then they are relatively common. Removing individuals for vouchering will have the largest impact on small or isolated populations such as threatened species, short range endemics, or island or range-restricted populations.

5.5.4 Has the WAM or other researchers requested specimens?

Some taxa are of particular interest to researchers or museum staff. If the collector has recently contacted the WAM (or other researchers) and knows that particular taxa are of interest, then it may become a priority to voucher those taxa, provided other considerations are satisfied (e.g., concern regarding impact of vouchering on the population).

5.5.5 Are there suitable alternatives to vouchering of specimens?

In some cases, it may be unnecessary, impractical or ethically unjustified to voucher certain species; particularly large macropods, crocodiles, cetaceans, large reptiles and birds, threatened or endangered taxa, short-range endemics and island or range-restricted populations. Alternative methods to vouchering include:

- Observational records, including descriptive notes and sketches.
- Photograph or video footage.
- Audio recording (frogs, birds, cetaceans, bats); and
- Tissue only vouchers.

5.5.6 Has the study area been well or poorly surveyed?

Specimens from poorly surveyed areas are valuable to increase our knowledge of fauna in those areas. However, even well surveyed areas may be of interest if there has been a bias in the animal groups surveyed or if the area has not been surveyed for a long time. Fauna assemblages change over time and these changes can be observed through voucher collections. Of particular interest is the arrival of introduced species in particular areas.

CONSERVATION IMPACT: Collection of adequate samples is required to ensure a valid result. However, consideration must be given to what effects taking the specimen may have on wildlife, populations and the environment (RIC, 1999).

Voucher specimens must not be routinely collected for species that are readily identifiable in the field. Where confirmation of field identification is necessary, consider other possible methods such as hair samples or photographs.

The optimal number of specimens to be collected will vary from case to case. Normally, no more than two whole voucher specimens (preferably one male and one female) should be collected from any single site. The permanent removal of large numbers of animals from any population must be avoided.

5.5.7 How equipped are you to correctly prepare, preserve and transport the specimen/s?

If you do not have suitable equipment to prepare, preserve and transport a specimen, then it should not be collected. This is especially true if it involves euthanasia of the animal. Sometimes a specimen will be encountered opportunistically, e.g., roadkill, and the observer must carefully consider the value of taking the specimen by weighing up the significance of the specimen against the chances of getting the specimen to the WAM in a suitable condition for accessioning.

5.5.8 What is the condition of the specimen?

To be useful as a specimen, the material must be in a suitable condition. Below is a guide to specimen quality:

- Road kill or beach washed specimens: whole, with skull intact, clean (no blood stains) and not decomposing (strong odour; fur, feathers or skin easily fall off) or desiccated. Sandy, beach washed specimens that are able to be rinsed are acceptable.
- Dry trap deaths and by-catch: preferably whole and not partially eaten by other trap inhabitants such as ants.
- Skeletal material: dry, whole and partial skeletal material may be useful, depending on species and condition. Broken or fractured bones/skulls are not useful.
- Eggs and nests: abandoned nests or eggs are a good record of breeding data for birds and turtles. Alternatively, a photograph and measurements of the eggs and/or nest can be used as an observational record.
- Thrown pouch young: a pouch young that is not able to be successfully reunited with its mother or rehabilitated by a carer (refer to department SOP for *Care of Ejected Pouch Young*). Care should be taken to euthanase the animal in a humane way (refer to department SOP for *Euthanasia of Animals Under Field Conditions*).

Note that the WAM is interested in any already dead specimen of a threatened or presumed extinct species, no matter what the quality/condition.

5.5.9 Is there a future need for validation or publication of research results?

Vouchering enables correction of published errors after re-examination of original voucher specimens. It also allows resolution of distribution limits of species, and permits long-term studies investigating changes, in aspects such as morphology or species composition over time. Some journals require that voucher and/or type specimens are lodged with the museum or other recognised natural history collections as part of their editorial policy. If a specimen is not lodged with a suitable, accessible collection, the results of research based on that specimen cannot be re-evaluated. This can be particularly relevant to species that are taxonomically uncertain, or future research, other than taxonomic, is undertaken on specimens.

6 Preparing and preserving specimens

The better the quality of the specimen, the greater its value in scientific research. A poorly preserved specimen is likely to be overlooked for use in research, or not accessioned to State collection.

Live animals vouchered as specimens are preferably euthanased using methods that do not damage the body, such as pentobarbitone injection. Euthanasia by a sharp blow to the head or decapitation is not recommended for vouchers, as it will destroy potentially important skull morphology used in the identification of some mammals and reptiles, as well as age characteristics of birds. Regardless, euthanasia by such means to prevent animal suffering (at the cost of the specimen) is the primary concern. Refer to department SOP for *Euthanasia of Animals Under Field Conditions* for more information on euthanasia.

6.1 Fresh specimens

Fresh specimens are those vouchers that have been collected alive and recently euthanased. The WAM is able to provide detailed information on preservation techniques upon request, but general methods are recommended (Table 1).

ANIMAL WELFARE: Administration of sodium pentobarbitone requires considerable training, appropriate animal restraint, and specific legal authorisations. Sodium pentobarbitone can only be kept by non-veterinary department personnel who have satisfied the applicable permit requirements of the WA Department of Health. In addition to obtaining the appropriate authorisations, non-veterinary personnel seeking to use this method must be trained in the correct dose rates and injection techniques by an experienced veterinarian and be supervised by qualified staff until deemed competent (Section 10).

Table 1 Recommended methods of preservation

Animal Group	Preservation Method
Mammals	Frozen or fixed in 10% buffered formalin solution* for 7 days, rinsed in water and transferred to 70% ethanol
Birds	Frozen
Reptiles	Frozen or fixed in 10% buffered formalin solution for 7 days, rinsed in water and transferred to 70% ethanol
Amphibians	Fixed in 5% buffered formalin solution for 7 days, rinsed in water and transferred to 70% ethanol. Do not freeze.

*Saturated (concentrated) formaldehyde is generally 37-40%. Dilution to obtain one litre is 100ml of formaldehyde and 900 ml water-preferably distilled and buffered. This is correctly termed 10% formalin (because 100% formalin is 37% formaldehyde) and it is the same as 4% formaldehyde. If formalin solution is not available, 100% ethanol may also be used.

Medium to large species, and species with heavy muscle or fat (such as gecko tails) will need to be injected with formalin into these fatty/muscular areas. All specimens should be lightly pricked with scalpel or needle tip to allow better absorption of formalin solution into tissue.

For best practice in the preservation of reptiles and frogs, specimens must be laid out in preservation trays that allow the limbs and toes to be arranged naturally. This preservation allows the researcher to accurately examine the specimen in the laboratory. The practice of bulk drumming of reptile and frog specimens is discouraged, as this will result in curled toes and limbs, and potential loss of important morphological characteristics.

Field number tags or data cards must be attached to each specimen. Be aware that hand-written paper tags will disintegrate in alcohol or formalin. Commercially produced field number tags are preferable and should be tied to the specimen with string.

Specimens to be frozen should be wrapped in newspaper or paper towel and double-bagged and sealed. Data should be included inside the second bag with a description of the contents written on the outside of the bag (Section 7).

6.2 Opportunistic specimens

Specimens may be obtained opportunistically throughout the course of field work, travel or recreational activities, when there is no prior intention to collect. The most commonly collected opportunistic specimens are those found dead on, or near, the road. Depending on the situation and the value of the opportunistic specimen, the observer may choose to collect the whole carcass and prepare it for freezing or immediate transport to the museum, or to obtain tissue samples only, if collection and preservation equipment is available (Section 5.2.8).

Although opportunistic specimens may be readily available and can provide a wealth of information, supplementing the need for live collecting of specimens, this material is often of inferior quality. If the specimen is of inadequate quality, an observational record of the specimen may still be valuable.

6.3 Tissue samples

Tissue sampling involves collecting a small sample of tissue and storing it in a suitable manner. The best quality tissue is often samples from the liver or muscle, and these are most often taken from vouchered specimens, minimising any external damage. The information provided here is a brief summary, for more details, refer to relevant SOPs, such as SOP *Tissue Sample Collection and Storage for Mammals* and *SOP Sampling Cetacean Using Remote Biopsy System.*

Modern systematic studies rely heavily on molecular data derived from specimens and this requires that tissue be taken from specimens immediately after euthanasia. As DNA begins to deteriorate rapidly after death, it is important to take a tissue samples immediately upon death and preserve it.

There are three main options for preserving and storing tissue samples. 100% ethanol is the preferred and easiest way to store and preserve tissue. Liquid nitrogen and DMSO were used a lot in the past and are provided here as options for reference.

1. 100% ethanol: a small sample of tissue placed in a 1.8 ml screwcap (Figure 2B), or push-cap vial (Figure 2C) filled with 100% ethanol. Screwcap vials with a rubber seal are preferred as they are more durable, not prone to popping open and reduce evaporation and desiccation. Multiple small samples are preferred to large pieces for better ethanol penetration and preservation of the sample. A small piece of paper with the sample reference/details written in pencil should be placed inside the vial, as well as written using an alcohol-proof marker on the outside of the vial. Vials containing ethanol should be placed in a fridge or freezer at -18 °C as soon as possible to avoid evaporation and facilitate long-term storage. Preservation is improved (and evaporation reduced) by keeping as cold as possible.
2. Liquid nitrogen or cryogenic freezer (-65 °C to -85 °C): samples placed without preservative into Cryovial screw-cap vial (Figure 2A). The specimen details (field or registration number) are written using permanent marker on the outside of the vial. DO NOT use Eppendorf or other push-cap vials as they will pop open in liquid nitrogen.
3. DMSO + salt: a small sample of tissue placed in a 1.8 ml screwcap or push-cap vial (Figure 2C) filled with DMSO + salt (dimethyl sulfoxide and NaCl). A pencil or permanent marker is used to write on a label attached to the vial. Samples stored in this way are stable at room temperature but must be kept away from heat (e.g., not kept in a hot car or in direct sunlight). Samples stored in this manner cannot be used for protein work and the storage media may limit application of some DNA techniques. A modern alternative is RNAlater.

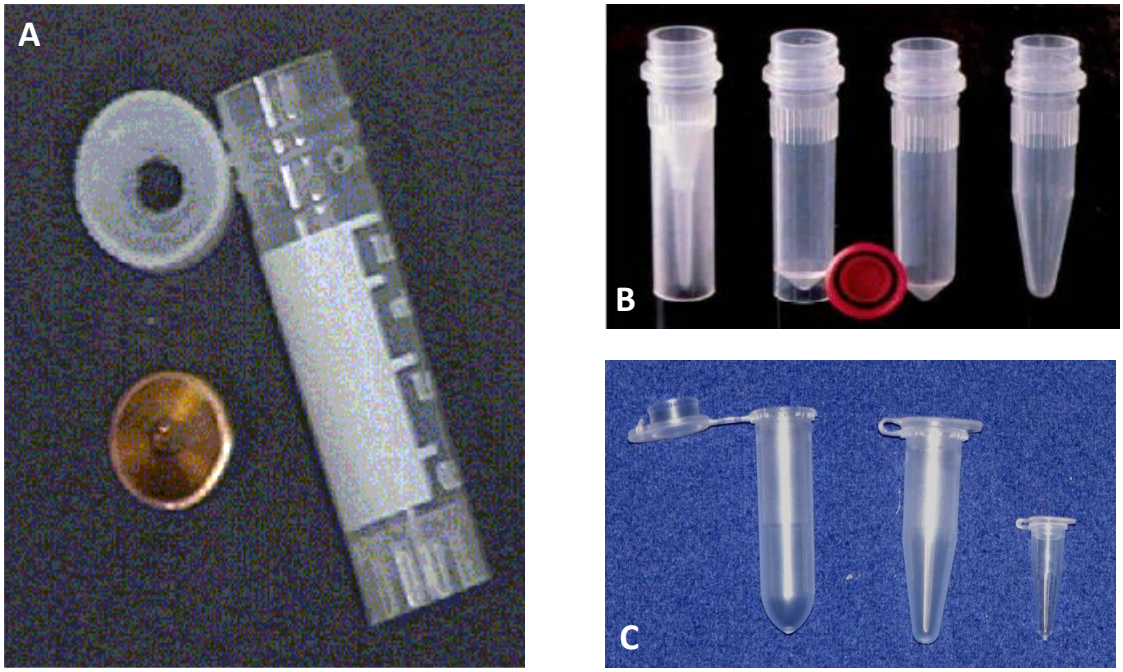


Figure 2 A) Nalgene cryovials used for storing tissue samples in liquid nitrogen or in a cryogenic freezer. B) Screw-cap vial with O-ring. C) Eppendorf push-cap vial used for storing tissue samples in 100% ethanol or DMSO + salt.

6.4 Wet pitfall trap by-catch

Specimens resulting from wet pitfall vertebrate by-catch are dried-out, brittle, discoloured and have no associated tissue sample for genetic analyses. Accordingly, such specimens are nearly useless for taxonomic research. Only where there is a significant range extension or where threatened or priority fauna are collected will wet pitfall vertebrate by-catch be considered for accession into the WAM collection. In some cases, extracted cranial and post cranial material from unusual/uncommon species of mammals may still be valuable to taxonomic work.

Note: Wet pitfall trapping is NOT a suitable method for collecting vertebrates. It is for invertebrates only.

7 Labelling specimens and recording data

An individual specimen is the 'ultimate sacrifice'. Consequently, it is essential to provide as much data with the specimen as possible. Without data, specimens are of no scientific value. The following sections provide advice on how to label specimens and what information to include on specimen labels.

7.1 Labelling

Detailed and accurate documentation (labelling, maintaining readability and preventing label separation) of the specimens is essential (NHMRC, 2004). Different labelling methods are appropriate for distinct types of specimens (Table 3). Labels should always be written clearly with a pencil (4B or dark HB) or water/chemical resistant pen (e.g., India ink) on chemical resistant, waterproof paper,

and securely fastened to the specimen or placed inside the specimen container. The data must physically accompany the specimen inside the container or cooler bag, when submitted to the Museum. Specimens received without data may be rejected.

Table 3 Data placement by method of specimen submission.

Method	Data Placement
Frozen	Data tag inside second bag containing bagged specimen and duplicated on outside of second bag.
Preserved	Individual field number tag attached securely to specimen; or data tag placed inside vial with specimen, with field number duplicated on outside of storage container. *Note: handwritten tags disintegrate in vials containing formalin or ethanol*.
Live Animal	Data tag attached securely to the outside of the container and replicated in notebook or datasheet. Live animals may eat or destroy paper tags included inside their container during transport.
Tissue	A small piece of paper with the field number written in pencil, placed inside the vial, and the number (replicated twice) and tissue type on the outside of the vial.
Observation/ Photo	Record on a datasheet or in a field notebook; duplicated by photocopy or scanning.

7.2 Field numbers

Field numbers are used by persons collecting specimens to identify the material before being examined for accessioning. Each field number should be unique for each specimen and recorded or attached to the specimen. Alternatively, field numbers can be recorded on a data tag kept with the specimen, duplicated on a datasheet or in a field notebook. Field numbers may have a prefix reflecting the collector using their initials, a project or survey code and should be as concise as possible. They are used to associate the specimen with other survey information such as capture data, capture site information and project information. They are primarily for reference by the collector.

7.3 Essential data for specimens and observations

The more data provided, the better. The minimum requirement for all specimens is:

- Field number (a unique field label distinguishing the specimen from others).
- Date of collection (written as 20 JUNE 2022).
- Collector's/observer's name and a contact detail.
- Detailed location (lat/long with general locality).
- Capture/observation method.

There are several other valuable pieces of information that should be noted on the datasheet such as, time of day the specimen was collected/observed, habitat and environmental conditions.

The location should be presented as a written site description including the nearest named point (e.g., rail crossing 3.6 km N of Gingin); and as latitude and longitude in degrees/minutes/seconds (not

UTMs), and the datum used if recorded by a GPS. Geographical coordinates must be converted by the collector to degrees/minutes/seconds before submission to the WAM database.

Identifications (even tentative) must be written as scientific (Latin) names. Common names are often problematic due to local colloquialisms and lack of consistency. For current nomenclature please refer to the Checklist of the Terrestrial Vertebrates of Western Australia available from the WAM website. At this site, you will also find specimen submission procedures and specimen data forms.

The following are additional notes or instructions regarding data requirements that apply to specific collection or observation methods.

7.4 Live captured and euthanased specimens

If the animal is to be euthanased, it is important to weigh the animal immediately after death, as this measure will not be accurate in the laboratory once preserved.

Other morphological measures that should be recorded are sex, snout-vent length, tail length, measures of the manus/pes/forearm/wing chord, ear length and breeding condition.

Note and photograph (if possible) any breeding colours or unusual markings that may be lost through preservation in formalin and ethanol. Soft part (feet, gape and eye) colours in birds often change with death.

7.5 Catch and release

Animals that are captured but not required as a voucher specimen should be released at the site of capture as soon as possible. Time permitting, the location, date, morphometric data, weight, breeding condition, age, sex and a digital photo of the animal will provide a good historical record for that animal. A tissue sample may also be taken. The record of the animal can be used as an observational record. If the animal is marked or tagged, record the tag number as the reference number for the observation.

7.6 ‘Tissue only’ specimens

A ‘tissue only’ specimen has no reference voucher if the identification of the specimen becomes questionable. Therefore, it is important to obtain the greatest amount of data from the source of the tissue sample. In addition to locality and morphological data, tissue sample data should include:

- Type of tissue taken; and
- specimen condition (released, dead on road, rotting/fresh).

Preferable is a digital photograph of the specimen or any tags/microchip numbers so that identification can be confirmed.

7.7 Observational records

Observational records usually record an event or behaviour of one or more species at a particular time and location. Observational records usually contain greater detail than standard records and have an emphasis on behaviour. The time, date and location (including habitat) are critical.

Observations can be used to record the presence of a species (e.g., bird hollow), behaviour such as breeding, or an event such as a stranding or migration. Observational records may also include static records such as nests, eggs, footprints/tracks, diggings, scats, hair, skin slough and skeletal debris.

7.8 Digital photographs

Digital photographs are an excellent tool for quick identification. Considerations when taking specimen photos are:

- Take photo against a contrasting background. Dark blue, red or green enhance colours of the subject, whereas a white background often darkens the subject.
- Photograph against a scale such as a ruler, lens cap or pen.
- Include field number or data in photo area to match photograph to specimen.
- Ensure the subject is in focus.
- Natural light is preferable.
- Take a series of photos:
  - overall dorsal and ventral (i.e., top and bottom), including tail.
  - close up of head.
  - close up of any key identifying characteristics (e.g., feet of mammals and geckos).
  - close up of any unusual characteristics (e.g., moult in birds).
  - photograph of the habitat.

8 Transporting and mailing specimens

Specimens must be stored and transported back to the laboratory with care to ensure they remain in good condition.

8.1 Transport of live animals

When transporting live animals directly to the WAM for vouchering, animals must be kept in secure holding cages or appropriate containers (refer to department SOP for *Transport and Temporary Holding of Wildlife*). Personnel must ensure that all animals are as comfortable as possible and have adequate food and water until they are delivered to the museum.

8.2 Transporting preserved specimens

Glass or plastic containers are commonly used for liquid storage of preserved specimens. Containers must be securely sealed to prevent leakage of liquid or fumes. Do not use metal containers that can corrode and stain specimens. Glass or plastic containers should be transported inside a larger container with cushioning material, or in an appropriate container where they may be stored upright.

The container should be as small as possible, but it should be large enough to allow extraction of the specimen without damaging it. Lightweight plastic bags (e.g., Ziplock or freezer bags) or small vials can be used to hold smaller or delicate species if stored in a container with multiple specimens. Holes must be punched in the bag or vial lid to allow ethanol transfer. The preservative should fill the entire container, leaving no air pocket, because agitation of the container can result in damage to the specimen (RIC, 1999).

Frozen specimens should be packed in a waterproof container with ice to prevent defrosting, and absorbent material to prevent any leaks.

Ethanol and formalin can be transported by road. For air freight shipping, the sender must adhere to ICAO Technical Instructions for the Safe Carriage of Dangerous Goods by Air. Alternatively, preserved

specimens can be drained of ethanol or formalin before shipping by air. The specimen should be wrapped in a dampened, absorbent towel, placed in a sealed, airtight bag, and double bagged with absorbent material in the outer packaging. The damp towel will prevent the specimen from drying out during transport. Specimens packaged this way may be sent by air express by courier and must be transferred back to preservative immediately on receipt.

8.3 Mailing specimens

Dry preserved specimens, including skulls, skeletons and skins may be sent using Australia Post. The specimen should be individually wrapped in cottonwool or bubble wrap, with plenty of cushioning material inside the box.

Dangerous good, such as liquid nitrogen and more than 30ml ethanol, must be not posted. However, Australia Post can ship some dangerous good with Australia, but only if dangerous are 'exempt'. Check with Australia Post whether your item is an exempt and consult with the receiving museum. Alternatively, tissues can be sent in 100% ethanol via road courier.

Formalin is not permitted to be shipped with Australia Post.

All specimens freighted to the WAM should be marked: 'Scientific specimens – Handle with care'.

Please state which department and personnel the package is intentioned to and advise WAM staff when you are sending specimens so they can expect delivery. WAM staff contact details can be found in Section 5.

9 Lodging and identifying specimens

9.1 Lodgement of specimens

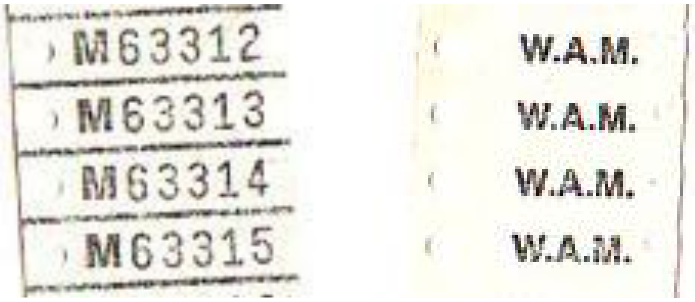
Specimens and observations should be forwarded to the WAM as soon as possible. The longer the delay in accessioning, the higher the probability of loss of valuable information and loss of, or damage to, the specimen.

WAM staff should be contacted well in advance before any specimen lodgement. WAM staff are often not available in the office to accept specimens and so meeting times must be pre-arranged. Specimens should be submitted during normal business hours (9 am - 3 pm, Monday to Friday). Live animals must not be submitted on a Friday after 12 pm as there may be insufficient time to process them under ethical guidelines.

Live animals collected for the WAM must be lodged for processing as soon as possible.

Note, that specimens will not be accepted without associated collection data, nor will live animals be accepted if they have not been transported in suitable containers or under suitable conditions.

Once accepted into the WAM collection, each specimen or group of specimens (e.g., one clutch of eggs, or a mother and pouch young) is given a unique registration number (Figure 4). These numbers are not available to external parties and collectors are encouraged to develop their own series of field numbers (Section 7.2).



(a) *(b)*

Figure 4: Examples of WAM Mammal Registration number tags: front (a) and back (b)

Visit the WAM's Terrestrial Zoology webpage for more information:

http://museum.wa.gov.au/research/collections/#terrestrial-zoology

9.2 Specimen identification

The WAM provides a specimen identification service. Specimens that are 'hard to identify' require a detailed examination to confirm their identity and this involves specialist identification skills. A fee for this service is applicable to cover the time and resources required to maintain the service. Charges do not apply to specimens donated by the general public. Contact the WAM for further information on fees.

10 Competencies

A person who is competent has the knowledge, skills, and experiences that allow them to capture and handle animals successfully, and appropriately manage adverse events as required. Department personnel, and other external parties covered by the department's Animal Ethics Committee, undertaking fauna-related activities require approval from the committee and will need to satisfy the competency requirements (Table 4). 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 animal welfare legislative obligations.

The sampling design details such as, intensity and scope of the study being undertaken, will determine the level of competency required and Table 4 provides advice for standard monitoring only.

Table 4 Competency requirements for Animal Handlers of projects involving vouchering of fauna specimens

Competency category	Competency requirement	Competency assessment
Knowledge	Broad understanding of the framework governing the use of animals in research and environmental studies in Western Australia	Training (e.g., DBCA Fauna Management Course or equivalent training). In applications, provide details on the course provider, course name and year.

	Understanding of appropriate chemical use, storage and disposal (e.g., formalin)	Personnel should be familiar with the uses, dangers and first aid treatment for chemicals being used for specimen collection and storage. This knowledge can be gained through consulting chemical information sheets, material safety data sheets and other literature. Personnel should also be familiar with good laboratory practices to ensure safety and minimise contamination of samples or chemicals.
	Understanding species biology and ecology	Personnel should be able to correctly identify the likely species to be encountered at the site(s) being studied and understand the species' biology and ecology. This knowledge may be gained through sufficient field experience and consultation of field guides and other literature.
	Understanding environmental conditions	Personnel should be aware of the environmental and seasonal conditions that may be expected on the project and understand location-specific animal welfare considerations. In applications, provide details of time spent undertaking similar work in similar locations.
Animal handling and tagging skills/experience required	Experience handling target species	Personnel should be experienced at hand restraint of species being sampled. This experience is best obtained under supervision of more experienced personnel. In applications, provide details on the longevity, frequency & recency of experience.
	Experience in sodium pentobarbitone use, storage and disposal Demonstrated ability to calculate and administer appropriate dose	Personnel require training and written endorsement of competency in specified procedures by a veterinarian. Personnel must successfully demonstrate the specified technique, including dose calculation, for the specified taxon to the satisfaction of a person experienced in the technique.
	Experience in collecting tissue for DNA analysis	Personnel should be familiar with the animal welfare principles of tissue sampling for DNA analysis. Personnel should be familiar with how to operate tissue sampling equipment. This experience is best obtained under supervision of more experienced personnel.

	Experience managing disease risk in wildlife management	Personnel should be familiar with hygiene procedures. This knowledge may be gained through sufficient field experience and consultation of literature.

In conjunction with possessing the required understanding and knowledge of fauna vouchering techniques and animal welfare requirements, a guide to the experience and skill requirements for an animal handler to be considered competent to voucher fauna is as follows: (noting that some personnel with experience may still require initial supervision in unfamiliar locations or with species that they have not encountered previously):

- Recency of vouchering experience: within the past 10 years.
- Minimum 2 individuals of similar species vouchered.

11 Approvals

A licence or authorisation may be required under the *Biodiversity Conservation Act 2016* (examples below). Contact the department's Wildlife Licensing Section for more information. It is your responsibility to ensure you comply with the requirements of all applicable legislation.

- Fauna taking (scientific or other purposes) licence (Reg 25)
- Fauna taking (biological assessment) licence (Reg 27)
- Fauna taking (relocation) licence (Reg 28)
- Section 40 Ministerial Authorisation to take or disturb threatened species.

12 Occupational Health and Safety

The following departmental SOPs are relevant to occupational health and safety:

- SOP *Managing Disease Risk and Biosecurity in Wildlife Management*
- SOP *Hand Restraint of Wildlife*

Departmental personnel, contractors and volunteers have duties and responsibilities under the Occupational Safety and Health Act 1984 and Occupational Safety and Health Regulations 1996 to ensure the health and safety of all involved. Fieldwork is to be undertaken in line with the department's corporate guidelines, policies and standard operating procedures, including but not limited to, risk management and job safety analyses. Further information can be found at https://dpaw.sharepoint.com/Divisions/corporate/people-services/HS/SitePages/SOPs.aspx

If department personnel or volunteers are injured, please refer to the departmental Employee Relations and Safety Section's 'Reporting Hazards, Near-misses and Incidents' intranet page, which can be found at

https://dpaw.sharepoint.com/Divisions/corporate/people-services/HS/SitePages/Reporting-Hazards,-Near-Misses-and-Incidents.aspx.

13 Further Reading

The following SOPs have been mentioned in this advice and it is recommended that they are consulted when proposing permanently mark mammals using ear notching:

- Department SOP *Animal Handling and Restraint using Soft Containment*
- Department SOP *Tissue Sample Collection and Storage for Mammals*
- Department SOP *Permanent Marking of Mammals using Ear Notching*
- Department SOP *Permanent Marking of Reptiles by Scale Marking*
- Department SOP *Transport and Temporary Holding of Wildlife*
- Department SOP *Managing Disease Risk and Biosecurity in Wildlife Management*
- Department SOP *First Aid for Animals*
- Department SOP *Care of Ejected Pouch Young*
- Department SOP *Euthanasia of Animals Under Field Conditions*

For further advice refer also to:

National Health and Medical Research Council (2013) *Australian code for the care and use of animals for scientific purposes*, 8th edition. Canberra: National Health and Medical Research Council. http://www.nhmrc.gov.au

Western Australian Museum (2022) *Checklist of the Terrestrial Vertebrate Fauna of Western Australia*. Available from: http://museum.wa.gov.au/research/departments/terrestrial-zoology/checklist-terrestrial-vertebrate-fauna-western-australia

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Scotts, D.J. & Craig, S.A. (1988) Improved hair sampling tube for detection of rare mammals. *Australian Wildlife Research* 15: 469-472.

RIC (1999). Voucher Specimen Collection, Preparation, Identification and Storage Protocol: Animals. Standards for Components of British Columbia's Biodiversity No. 4a. Resource Inventory Committee, Ministry of Environment, Lands and Parks, Canada.

15 Glossary of Terms

Accessioning: The formal process of recording an object in a museum's records as part of the museum's permanent collection.

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

Chief Investigator: A person listed on an application to the department's Animal Ethics Committee that will be responsible for all aspects of the project; this is generally the proponent of the project.

Collecting: Obtaining a representative specimen or series of representative specimens for examination.

Observation: A documented record of a species associated with a geographic location, date and time; may be accompanied by photographs, video, audio recording or tissue sample.

Specimen: A whole animal or a part thereof but can also comprise of photographs and audio and video recordings.

Tissue only voucher: An observational record with associated preserved DNA material in the form of a tissue sample.

Tissue sample: A sample of tissue taken from a live or deceased animal that includes ear clip/notch, toe clip, tail clip, skin, skin scrape (cetaceans), muscle, liver, heart, blood, hair, feather, egg shell, scale, faecal sample, egg or semen.

Voucher: A representative specimen or representative specimens of a defined taxon, variant of known taxon or an unknown taxon. A voucher may be in whole or part of an animal and may have been euthanased (after live capture) or deceased (found dead).

Vouchering: The process by which a voucher is collected and retained through preservation with a view to provide a specimen for later reference or examination. Vouchering permits independent verification of results and allows further study.