Minimising Disease Risk in Wildlife Management

Standard operating procedures for fauna translocation, monitoring and euthanasia in the field

DEPARTMENT OF
Conservation
AND LAND MANAGEMENT
Conserving the nature of WA

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Minimising Disease Risk in Wildlife Management

by

Tamra Chapman[1], Colleen Sims[2] and Peter Mawson[1]
Department of Conservation and Land Management
[1]Locked Bag 104, Bentley Delivery Centre WA 6983
[2]89 Knight Terrace, Denham WA 6537

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1. Introduction

Department of Conservation and Land Management (CALM) personnel conduct biological surveys, fauna monitoring programs, captive breeding programs and translocations. They also handle sick, injured, orphaned and confiscated wildlife. This document is intended as an operational guide to minimise the risk of hazards to personnel and to ensure that animals do not suffer unnecessary harm. The primary purpose of this document is to present standard operating procedures to minimise the risk of disease transmission between wildlife populations and from wildlife to CALM personnel and their families.

The guide begins with a discussion of selected sections of the relevant legislation because CALM personnel who work with wildlife must have a good understanding of the relevant sections of the *Occupational Safety and Health Act 1984*, *Animal Welfare Act 2002* and the *Environment Protection and Biodiversity Conservation Act 1999*. CALM personnel must also comply with the *Australian code of practice for the care and use of animals for scientific purposes* under the provisions of the *Animal Welfare Act 2002*. These documents can be viewed online by clicking on the links in the text.

The remaining parts of the guidance are designed to raise awareness among CALM personnel of the potential for injury and disease transmission and to provide guidance to minimise the risk of disease transmission between wildlife populations and from wildlife to CALM personnel and their families. Practical guidelines address how to deal with orphaned, sick or injured animals and injury or illness involving CALM personnel. Finally, standard operating procedures for fauna translocations, monitoring, keeping and euthanasia are presented.

2. Legislation

2.1. Occupational health and safety

The *Occupational Safety and Health Act 1984* (*OS&H Act 1984*) requires employers to identify potential hazards and to develop strategies to minimise the risk of injury or disease. The *OS&H Act 1984* also requires employees to ensure their own safety by following instructions and correctly using any safety equipment provided. Sections 19 and 20 of the *OS&H Act 1984* outline the duties of employers and employees.

Occupational Safety and Health Act 1984

19. Duties of employers

(1) An employer shall, so far as is practicable, provide and maintain a working environment in which his employees are not exposed to hazards and in particular, but without limiting the generality of the foregoing, an employer shall -

(a) provide and maintain workplaces, plant, and systems of work such that, so far as is practicable, his employees are not exposed to hazards

(d) where it is not practicable to avoid the presence of hazards at the workplace, provide his employees with, or otherwise provide for his employees to have, such adequate personal protective clothing and equipment as is practicable to protect them against those hazards, without any cost to the employees

20. Duties of employees

(1) An employee shall take reasonable care - to ensure his own safety and health at work; and

(b) to avoid adversely affecting the safety or health of any other person through any act or omission at work.

(2) Without limiting the generality of subsection (1), an employee contravenes that subsection if he –

(a) fails to comply, so far as he is reasonably able, with instructions given by his employer for his own safety or health or for the safety or health of other persons

(b) fails to use such protective clothing and equipment as is provided, or provided for, by his employer as mentioned in section 19(1)(d) in a manner in which he has been properly instructed to use it

2.2. Animal welfare

Sections 3 and 19 of the *Animal Welfare Act 2002*, provide for the protection of animals.

Animal Welfare Act 2002

3. Content and Intent

(1) This Act provides for the protection of animals by -

(a) regulating the people who may use animals for scientific purposes, and the manner in which they may be used; and

(b) prohibiting cruelty to, and other inhumane or improper treatment of, animals.

(2) Intends to -

(a) promote and protect the welfare, safety and health of animals;

(b) ensure the proper and humane care and management of all animals in accordance with generally accepted standards; and

(c) reflect the community's expectation that people who are in charge of animals will ensure that they are properly treated and cared for.

19. Cruelty to animals

(3) a person in charge of an animal is cruel to an animal if the animal -

(e) is not provided with such shelter, shade or other protection from the elements as is reasonably necessary to ensure its welfare, safety and health;

(h) suffers harm which could be alleviated by the taking of reasonable steps;

(j) is, in any other way, caused unnecessary harm.

In the context of Section 19(3)(j), 'harm' may include illness due to any infection with disease causing organisms, when it could be prevented by appropriate management practices during the handling and moving of animals.

2.3. Use of animals for scientific purposes

CALM personnel must comply with the *Australian code of practice for the care and use of animals for scientific purposes*. The code of practice outlines general principles to reduce the impact of scientific studies on animals.

Section 1 General Principles for the Care and Use of Animals for Scientific Purposes

1.3 People who use animals for scientific purposes have an obligation to treat them with respect and to consider their welfare as an essential factor when planning or conducting projects.

1.4 The acquisition, care and use of animals for all scientific purposes in Australia must be in accord with this Code and with Commonwealth, State and Territory legislation.

Section 5 Wildlife Studies

5.1.7(iii) all materials and equipment used in the capture, holding transport and manipulation of animals must be cleaned and maintained in a way that minimises the assessed risk of disease transmission.

5.4.3 Holding areas and containers must be safe, quiet and hygienic.

5.4.4(v) Close confinement devices such as bags and crates must minimise the risk of disease transmission.

5.7.1(i) Field techniques: Minor procedures…identification (e.g. leg banding, ear tagging, microchipping, radio-tracking devices), …and sampling (e.g. hair feathers, scales, blood, stomach contents)…must be performed in an uncontaminated area by competent persons, using clean equipment in each instance.

2.4. Environment protection and biodiversity conservation

The transmission and spread of disease between individuals, populations or species via human activity can represent a significant threat to biodiversity conservation, especially when dealing with species that are already threatened. Section 18A of the *Environment Protection and Biodiversity Conservation Act 1999* details offences relating to threatened species.

Section 18A Offences relating to threatened species etc:

(2) A person is guilty of an offence if:

(a) the person takes an action; and

(b) the action is likely to have a significant impact on:

(i) a listed threatened species; or

(ii) a listed threatened ecological community;

and the person is reckless as to that fact.

3. Hazards

3.1. Occupational safety and health

CALM personnel potentially face a number of hazards when working with wildlife, including:

- Physical injuries, such as bites, scratches and blows from animals and cuts and abrasions from equipment. Severe bite injuries or blows from fins and flukes are a particular risk from marine mammals.

- Allergies to animal material such as hair and feathers.

- Zoonotics, which are diseases that affect both animals and humans. Zoonoses are diseases found in animals that may be transmitted to humans.

- Chemicals that are used by field staff e.g. to preserve tissue samples.

3.2. Animal welfare and conservation

A number of risks to the health of individual animals and animal populations are associated with interacting with humans:

- Physical injury to the animal (including creating open wounds which are susceptible to infection).

- Transmission of infectious agents between individual animals via human hands and/or the surface of any equipment coming in contact with animals.

- Stress, which can increase susceptibility to disease. Stressed animals may also excrete infectious material into the environment, increasing the chances of disease transmission.

- Irritation of the skin, eyes etc. from contact with residual disinfectants used on equipment.

4. Safety

CALM personnel must take precautions to minimise the risk of disease transmission to protect themselves, their families (children, the elderly and pregnant women are particularly vulnerable to zoonoses) and wildlife populations.

To minimise the risk of disease transmission, CALM personnel can take some simple precautions:

- Obtain an Occupational Alert Card from the Risk Management Section and carry the card at all times.
- Maintain high levels of personal hygiene such as washing hands before and after handling animals and before eating.
- Do not eat, drink or smoke cigarettes while handling animals.
- Keep animals, animal products and animal waste away from food preparation and storage areas.
- Ensure all trapping and handling equipment is clean and in good repair and working order before use.
- Keep up to date with information about any specific diseases that may be encountered when working with wildlife.
- Wear long sleeves and pants and use insect repellent in regions affected by Ross River Virus and other insect-borne diseases.
- Wear protective clothing including gloves, boots, overalls and a face mask if you are likely to come into contact with blood, waste or any other body fluids of animals. Disposable items are preferable because they reduce the risk of cross contamination.

- Use preserving chemicals in a well ventilated area and ensure containers are tightly capped after use.

- Scrub down the work area and equipment, including the vehicle used to transport the animals, with disinfectant detergents after use.

- Use disinfectant detergent and hot water to wash field clothes and other equipment that has come into contact with the blood, waste or other body fluids of animals.

5. Prevention

You can minimise the risk of injury or of being exposed to zoonoses by following three simple steps before handling wildlife:

5.1. Spot the hazard

- Review infection and injury control before and during animal handling procedures.
- Be aware of sources of possible contamination or injury.
- Ensure suitable safety and cleaning equipment is available and is used correctly.
- Ensure you are familiar with safe handling and disposal procedures for contaminated materials.

5.2. Assess the risk

- Consider the likelihood of disease or harm occurring.
- Assess whether existing safety procedures are working or need improving.

5.3. Make the changes

- Follow the guidelines in this document to minimise the risk of infection or injury.
- Report any hazards or unsafe procedures to your program manager and make the changes needed to minimise the risk.

6. Diseases and disease transmission

Zoonoses are diseases found in animals that may be transmitted to humans, including specific agents that cause disease in many species, such as tuberculosis, toxoplasmosis and rabies. Many zoonoses do not show symptoms in the host animal, but may be very debilitating (e.g. Ross River virus, Echinococcus) and even fatal in humans . Similarly, even healthy animals, including humans, carry bacteria with them on all parts of their body, which can potentially cause disease in humans or other animals (e.g. Salmonella, *E. coli*, Pasturella).

All animals should be handled with the assumption that they carry disease, especially if they appear sick.

Diseases may be present in any living or dead animal material including faeces, fur, hides, blood, urine, other bodily fluids and carcasses. Vectors such as ticks, mites and mosquitoes can transfer disease but disease causing agents can also be transmitted via the air, dust, food, water and anything else that comes into contact with the animal. This includes trapping, tagging and measuring equipment, cages and handling bags, food containers, water containers and bedding.

People and other animals can catch diseases through inhalation of contaminated dust or droplets, ingestion of contaminated food or water. Diseases can also be contracted via direct contact with animal material via broken skin, unbroken skin, mucous membranes, or indirectly from the hands to the eyes and mouth.

Some diseases have a relatively simple mode of transmission, while others go through a complex lifecycle and the symptoms may not appear for weeks or even months. In addition, animals can carry the agents of disease and can transmit disease, but do not suffer from disease or ill health themselves. **Always** seek medical advice if you are injured at work or become unwell.

Very little known about specific diseases in wildlife, so it is impossible to take specific precautions against infection and disease transmission. This is why **the basic principles of personal and equipment hygiene must be followed at all times**

(see Section 4 and Appendix I) to minimise the risk of exposure to disease agents and minimise the risk of spreading disease.

CALM personnel should make themselves aware of any diseases known to be associated with a particular species or region in which they work, including the:

- Biological agent that causes the disease such as a virus, bacterium, fungus or parasite (if known).
- Host or animal that carries the disease.
- Mode of transmission from the host to humans.
- Symptoms in animals.
- Symptoms in humans.
- General and specific principles of how to prevent the spread of disease.

Information on common zoonoses is provided in Appendix II, but this is not an exhaustive list and other potential sources of information on zoonoses include:

- CALM Section or Program Manager
- CALM Risk Management Section (Ph 9344 0359)
- Australian Wildlife Health Network
- Australian and New Zealand Council for the Care of Animals in Research and Teaching (AANZCCART)
- *Occupational Safety and Health Act 1984*

- *Diseases acquired from animals*. National Occupational Health and Safety Commission (1989). Australian Government Publishing Service, Canberra.

- Western Australian Department of Health

- Worksafe SafetyLine

- Animal Health Australia

7. Diseases and injuries in wildlife

7.1. Recognising diseased animals

Disease and ill health may not be obvious in wild animals because they hide signs of weakness, which would make them vulnerable to predation, by instinct. However, there are a few simple signs to look out for that may suggest an animal is not completely healthy:

- Thin (boney) and underweight.
- Poor coat condition (dry, harsh, matted, patchy).
- Signs of diarrhoea (soft wet faeces around tail, trap, bag, or stuck to fur).
- Large numbers of external parasites (ticks, fleas, mites).
- Discharges from eyes or nostrils.
- Sneezes, coughs, noisy breathing or heavy breathing (when animal is calm and not stressed).
- Open wounds present in large numbers (may look old and infected).

7.2. Dealing with diseased or injured animals

If an animal is sick or injured:

- Isolate the animal in a dark, quiet place.
- Handle or care for the animal only after processing all other healthy animals.

- Wear a face mask and gloves and wash hands and field clothes with disinfectant detergent and hot water after handling.

- Disinfect food and water dishes, all trapping, handling, measuring and marking equipment (including nets, bags, scales, callipers, ear tagging/marking pliers, scissors etc.) after contact with the animal.

- Clean and disinfect hands after handling sick or injured animals, particularly if you get blood, faeces or other animal material on your hands. Carry a spray bottle containing non-irritant disinfectant and spray this on hands when necessary (e.g. dilute Viraclean®, Savlon®, or antibacterial liquid soap).

- Incinerate bags that have been used to handle sick or injured animals.

- Retain dead animals for post mortem. Animals must be preserved or frozen and stored as outlined below. All relevant information on the species, collector, date of collection and the location where the animal was collected must be recorded and included with the specimen.

- Animals kept in captivity that are sick must be examined by a vet who is familiar with native fauna and wildlife medicine. Ensure the animal is comfortable (not suffering) and contact your program manager to arrange for a veterinary examination or post mortem as required.

7.3. Recording information on diseased animals

Assessment of disease cases requires consultation with a veterinary surgeon who is experienced in native animal health. Contact your program leader, or wildlife veterinarian/pathologist (Department of Agriculture WA or the Australian Wildlife Health Network) and ask for advice on whether sample collection or euthanasia is required. Collect and store the samples or preserve and store the animal as instructed. You can assist in diagnosis by taking photographs of physical abnormalities and recording the following information:

- The time, date, location and habitat in which the animal was found.
- Species, weight, size, sex, age, reproductive status (pregnant, lactating) and physical condition.
- Circumstances surrounding the capture of the animal.
- Name and contact details of the person who found the animal.
- Cause of death, if the animal is deceased.
- Mobility (e.g. limb and tail function).
- Sensory function (e.g. response to sound and light).
- Nervous system (e.g. response to gentle shaking, lack of balance, lack of coordination).
- Other signs of illness, disease or injury.
- Behaviour, if abnormal.
- Method of euthanasia, if it was required.
- Method of carcase disposal or destination of the carcase (e.g. Department of Agriculture or WA Museum).

Write a report outlining the incident and the actions you took. Communicate the incident and outcome to the Australian Wildlife Health Network and other CALM field personnel so that they may take appropriate precautions against disease transmission and make the changes needed to prevent re-occurrence.

7.4. Decision making

If an animal has signs of illness, is injured or orphaned, field staff must decide on whether it should be released, taken into care or euthanased. This decision should

be based on the conservation status of the animal, its chances of survival, the availability of rehabilitation facilities and any requirement for research or educational purposes (e.g. for display at Perth Zoo).

The animal can be released if it is likely to recover from the illness or injury, it is able to function normally and its social requirements (e.g. maternal care) can be met. The animal can be rehabilitated if suitable facilities are available and it is likely to recover good health. Euthanasia may be required if the animal is orphaned, has injuries from which it will not recover and/or it is likely to suffer for a long period of time before it can be treated adequately.

Appropriate decisions about sick, injured or orphaned animals must be made on a case by case basis. Field staff can decide on whether the animal should be released, taken into care or euthanased by using the chart in Appendix III. A written record of the outcome of the decision making must be kept for each animal as this may be required for inclusion in an annual report to the CALM Animal Ethics Committee.

7.5. Euthanasia

The decision to euthanase an animal must be based on the degree of suffering and the chances of recovery. If an animal is severely injured and is suffering, it must be euthanased as soon as possible. The goal of euthanasia is to use humane methods to produce a painless, rapid death and to avoid exciting or alarming the animal. The technique used should be reliable, simple and safe. Animals must be euthanased in a quiet area, away from other animals, because distress signals from the sick or injured animal may cause fear and distress amongst the other animals.

The preferred methods of euthanasia depend upon the species, size and age of the animal, the availability of equipment and the competency of staff in the application of euthanasia techniques. The appropriate methods for euthanasia for a variety of species, principally for use under field conditions, are shown in Appendix IV and discussed in Appendix V.

After using a euthanasia technique on an animal, it is essential to establish that the animal is dead before disposing of the carcase. This can be difficult for some animals such as reptiles and amphibians. Several signs can be used to establish that death has occurred including: absence of breathing; absence of a heart beat and a pulse; loss of colour (changing from pink to white or grey/blue) in the mucous membranes; no corneal reflex or response by the eyelid when stimulated and glazing of the eyes. If there is any doubt about confirmation of death, a second method should be used to kill the animal to ensure it is dead.

Where possible, dead or euthanased animals should be donated to the Western Australian Museum collection because these collections form the basis of our understanding of the state's biodiversity. Contact the Western Australian Museum and report the condition of the animal to determine if they are willing to take the specimen. Whenever possible, voucher specimens should be delivered 'live' to the Museum, provided they are not caused unnecessary harm. These animals will be euthanased via lethal injection. If the animal must be euthanased in the field, ask the Western Australian Museum to advise you on the preferred method of euthanasia for voucher specimens because some euthanasia and preservation techniques will reduce the value of a specimen for curation in the Western Australian Museum collection. Animal specimens for museum collections must be preserved and the method of preservation depends on the condition and intended use of the specimen.

7.6. Preserving dead animals

Small animals

- 100% ethanol, particularly if DNA analysis is required. The body cavity must be opened along the ventral mid-line to allow the preservative to penetrate the internal organs and the animal must be immersed in about five times the volume of the specimen.

- 70% ethyl alcohol (a mix of seven parts methylated spirits to three parts water). This will suffice in most cases for small specimens if ethanol is not available. The body cavity must be opened along the ventral mid-line to allow the preservative to penetrate the internal

organs and the animal must be immersed in about five times the volume of the specimen.

Birds and large animals

- Wrap the body in damp tissue paper, cotton wool or cloth, place it in a plastic bag or container and freeze. This method is suitable for larger animals or where preserving fluid is unavailable.

All relevant information on the species, collector, date of collection and the location where the animal was collected must be recorded and included with the specimen. Arrangements should then be made to forward the specimen to the Western Australian Museum as soon as practicable. If the specimen is not required for the Western Australian Museum collection, the body should be either buried at an appropriate site or disposed of at an approved refuse disposal site. Contact the local shire to arrange disposal for animals euthanased on shire land.

Dead animals carry and shed infective agents, so appropriate care and hygiene must be maintained during handling, storage and transport of specimens and carcasses.

8. Incidents involving CALM personnel

Treat injuries immediately, seek medical advice if you or members of your family become ill and report the incident to the Risk Management Section:

- Flush bites, cuts and scratches immediately with running water and skin disinfectant (e.g. Betadine®). Bites from seals, for example, carry bacteria which can cause severe infection and illness if not treated immediately.
- Cover exposed wounds with a waterproof dressing.
- Report unexplained or persistent illness (e.g. intestinal, respiratory or skin problems) to a medical practitioner.
- Seek medical attention and alert the practitioner to the potential for exposure to zoonoses by presenting your Occupational Alert Card.

8.1. Paper work

CALM employees, their managers and witnesses to the incident must complete the following forms and submit them to the Risk Management Section within the required times shown on the forms:

- Safety Investigation and incident notification
- Form 1B - Employer's Report – Worker's Compensation
- Form 2B - Employee's Report Form
- Form 5A - Witness Statement Form – Worker's Compensation
- Form 4 - Travel Accident Claim – Worker's Compensation if the incident involved a travel accident

Remember that many diseases have a long incubation period and symptoms may take a long time to develop in CALM personnel or their families, so every incident must be reported within the time shown on the forms.

9. Translocations and fauna monitoring

All translocations, fauna monitoring and survey activities must be conducted in accordance with the *Occupational Safety and Health Act 1984*, *Animal Welfare Act 2002*, *Environment Protection and Biodiversity Conservation Act 1999* and the *Australian code of practice for the care and use of animals for scientific purposes* as discussed in Section 1.

When planning a translocation or fauna monitoring program, prepare a Translocation Proposal for approval by Director of Nature Conservation and apply for an endorsement from the CALM Animal Ethics Committee. Review case histories of diseases in wild populations, known incidences of disease in captive populations as part of your proposal and detail the steps that will be undertaken to minimise risk during the program.

A translocated animal can bring with it many internal and external parasites that can infect other individuals or species at the release site. Consider whether animals should be inoculated or treated to prevent the spread of disease between populations, particularly for programs between the mainland and islands. Seek veterinary advice to select, obtain and administer suitable drugs e.g. Ivermectin® or Panacur® to reduce the parasite load prior to release.

Island populations may be particularly susceptible to disease agents that may be of little consequence to mainland populations. When working with island populations, always use new (unused) equipment where ever possible. If this is not possible, use cages that do not have rust or damaged components because these can harbour disease agents. Every piece of equipment used, including personal equipment like boots, should be thoroughly disinfected (or sterilised, if possible) before going to the island.

Never translocate an animal that does not appear 100% healthy. If an animal shows **ANY** signs of disease or ill health (see Section 7):

- **DO NOT** release it to another location.

- Take it to a captive quarantine facility where it can receive treatment if it is likely to recover full fitness for release and/or it is unlikely to suffer for a long period of time (more than 6 hours) before it can be treated adequately.

- Euthanase it if it will not recover full fitness for release and/or it is likely to suffer for a long period of time (more than 6 hours) before it can be treated adequately. Preserve the animal or collect tissue samples for analysis to determine the nature of the disease.

9.1. Recommended procedures for translocation and monitoring programs

Successful translocation and monitoring programs rely on effective planning, communication and evaluation. In addition, **the basic principles of personal and equipment hygiene must be followed at all times (see Section 4 and Appendix I) to minimise the risk of exposure to disease agents and minimise the risk of spreading disease**.

CALM personnel can minimise the risk of harm or disease by following these steps:

- Establish clear protocols for each step of the translocation or monitoring program in accordance with approved documents, Animal Ethics Committee endorsements and approved operating procedures.

- Write an itinerary for the translocation or monitoring program with a list of the steps to be carried out, the participants, their contact details and their tasks and responsibilities.

- Identify potential risks to a successful program and develop contingency plans.

- Distribute the itinerary to all participants as part of a briefing and ensure that all participants carry out their tasks in accordance with the

itinerary so that the translocation or monitoring program is completed correctly and so that equipment is cleaned and prepared for the next field trip.

- Use new or clean animal holding bags/boxes for each site to avoid cross contamination for each translocation (essential for Island populations). If this is not possible due to limited resources or the specialised nature of the transport cages, then all bags and cages that are to be reused must be cleaned in 1% bleach solution or dilute Viraclean®, soaked in solution for at least 10 minutes, rinsed with clean water and dried in the sun prior to re-use.

- Keep the bags and cages used at specific sites exclusive to those sites for standard monitoring programs that involve regular trapping. Alternatively, ensure that bags and cages are washed in 1% bleach solution or dilute Viraclean®, soaked in solution for at least 10 minutes, rinsed with clean water and dried in the sun before storage at the end of each field trip.

- Clean any equipment, cages or bags that are contaminated with bait material (universal bait or bait that contains meat meal etc.) with detergent to ensure that no residue remains. Remnant bait will attract vermin to equipment during storage, increasing the risk of contamination.

- Clean cages and traps prior to the next field trip if they are not used regularly. Equipment that has been stored may be contaminated by contact with native fauna (e.g. possums) or vermin such as rats and mice and so must be cleaned and disinfected before use.

- Wash all equipment used during field trips (such as tarpaulins and protective floor covers in vehicles) between trips to remove any urine and faeces that could cause cross-contamination.

- Clean and disinfect (e.g. with alcohol, chlorhexidine, Viraclean®) all equipment used to measure or mark animals, including tool-boxes used to store the equipment, after each field trip.

- Exchange bags, traps or other equipment that are contaminated with faeces, urine, blood or vomit with clean ones and clean and disinfect before using them again.

- Clean and disinfect hands regularly during the day, to reduce risk of disease transmission from your hands to many other animals (carry a spray bottle of dilute disinfectant or hand cleaner at all times).

- Clean and disinfect (e.g. with alcohol, chlorhexidine, Viraclean®) all equipment used to cut or pierce skin (e.g. ear tags, scissors, hole punches) before and after every use on each animal. If possible, store the instruments in a container containing non-irritant disinfectant e.g. swabbing alcohol, Chlorhexidine®, dilute Betadine®. Replace the disinfectant solution regularly (e.g. between locations, at the end of each session, or if they become contaminated with physical material).

- Use only sterile syringes and needles or swabs for the collection of laboratory samples. If blood or other samples are required for laboratory analysis, under no circumstances is the same equipment to be used to take samples from more than one animal.

- Dispose of syringes, needles and swabs correctly. Place needles into a 'sharps' container and bag syringes and swabs before disposing of them into approved refuse disposal sites.

- Wash all personal clothing and equipment in detergent and hot water after each field trip.

10. Keeping wildlife in captivity

CALM Personnel may be involved in the keeping of wildlife in captivity for:

- Captive breeding.
- Care of injured, recuperating and orphaned wildlife.
- Education and displays.
- Translocations.
- Scientific experiments or research trials.

The same principles of good hygiene, occupational safety and health and animal welfare already discussed also apply to keeping animals. In addition to disease management and prevention, the food, housing (design, maintenance and cleaning) and behavioural needs of the animals must be met. Sources of information and advice on keeping wildlife in captivity include:

- *Australian code of practice for the care and use of animals for scientific purposes*.
- Species specific husbandry manuals produced by zoos and scientific institutions.
- CALM Animal Ethics Committee standard operating procedures.
- Experienced wildlife carers, veterinarians, wildlife parks and zoos.
- Relevant specialist groups with knowledge of the species' requirements (e.g. Aviculturalists, Herpetologists).
- Peron Captive Breeding Centre Husbandry and Procedures manual.

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Appendix I. Basic principles for cleaning and disinfection

The methods used to clean equipment must be determined by the program manager, depending on the degree of risk and the availability of facilities and equipment.

High risk

Any translocations between the mainland and islands or between populations that are known to have had diseases present in the past represent a high disease risk situation. Remove any animal products and bait from cage traps, then wash the traps, soak in Viraclean® for ten minutes, rinse in clean water and air dry in the sun.

Low risk

Standard monitoring and translocation programs, such as *Western Shield*, represent a low disease risk situation provided you follow the basic principles of personal and equipment hygiene at all times to minimise the risk of exposure to disease agents and to minimise the risk of spreading disease. In low disease risk situations and where the ability to clean traps is limited by equipment, wash cage traps in 1% bleach solution (1 part bleach to 10 parts water), rinse in clean water and air dry them in the sun.

Cleaning and disinfection

Equipment must be cleaned **before** disinfecting, because many of the disinfectants become de-activated when they come in contact with organic material.

Mechanical Cleaning

Simple thorough washing and scrubbing of hands, bags and equipment with soap/detergent and hot water to remove all dirt and faeces etc., will remove much (but not all) of the biological contaminants and agents that can transmit disease.

Drying and sunlight

Drying and exposure to sunlight (e.g. hanging hessian bags in sun), will kill most (but not all) bacteria. Bacteria flourishes in warm, moist environments with biological material such as blood, tissue and faeces.

Chemical Disinfectants

Once equipment and hands have been mechanically cleaned, application of various chemical disinfectants will kill most (but not all) of the remaining biological agents of disease.

When selecting and using chemical disinfectants, ensure that they are:

- Broadly or universally effective.
- Non-irritant to skin and other tissues.
- Prepared in accordance with the manufacturer's instructions (e.g. concentrations/dilutions) and used as directed.
- Used on the surface of the hands and equipment
- Rinsed off so that no residue remains in the trap or bag. Residues can cause irritation to animals and the smell may discourage them from going into traps.

Common effective disinfectants include:

- Povidone iodine e.g. Betadine®. A non-irritant that can be used on the skin and wounds of animals and is effective against most bacteria, fungi and many viruses.
- Chlorhexidine e.g. Savlon® or Hibitane®. Dilute as recommended and use on equipment or skin. Useful against some viruses including rabies (and therefore probably bat

lyssavirus), but less effective against some bacteria. This disinfectant is effective in the presence of organic material.

- Swabbing alcohol. A rapidly acting disinfectant that kills most bacteria and some viruses. Drying to skin and causes irritation to eyes and open wounds.

- Chlorine bleach e.g. sodium hypochlorite. Effective against bacteria, spores, fungi and many viruses. Causes irritation and can also be corrosive to metal and fabric. SHOULD NOT BE USED ON ANIMALS OR HANDS and must always be thoroughly rinsed off anything that is likely to come into contact with animals.

- Ammonia compounds are NOT recommended.

Even if the highest standards of cleaning and disinfection are employed, some bacteria, fungal spores and viruses will still be resistant to these common disinfectants. It is not possible to achieve complete sterilisation in the field. This is why **the basic principles of personal and equipment hygiene must be followed at all times to minimise the risk of exposure to disease agents and minimise the risk of spreading disease.**

Appendix II. Common zoonoses

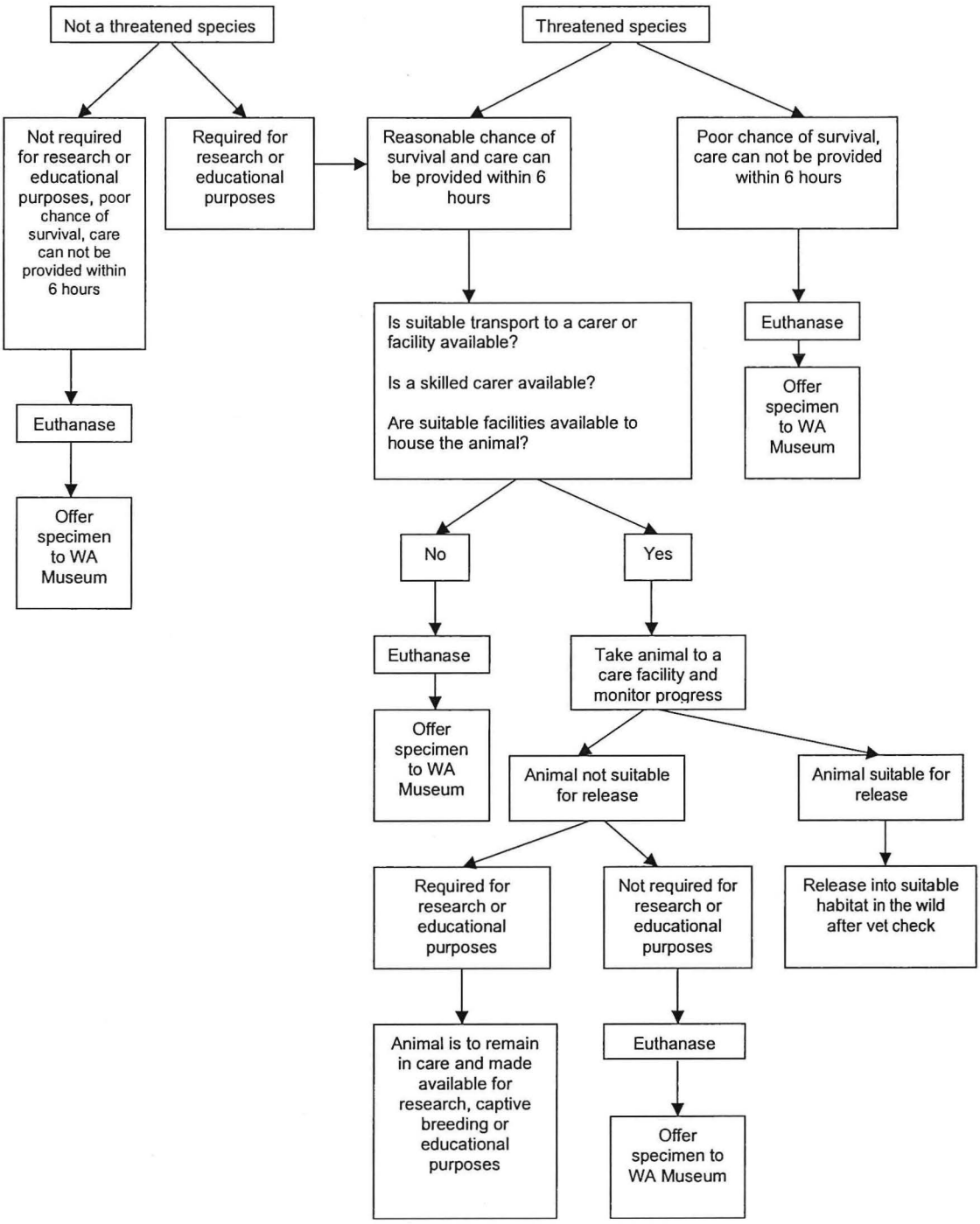
Disease and causative organism	Animals involved in transmission	Method of transfer	Animal Symptoms	Human Symptoms	Possible method to reduce risk	Diagnosis and treatment
Q FEVER *Coxiella burnetti* Bacteria-like organism	Terrestrial mammals; bandicoots, kangaroos, wallabies	Contact with infected animals, placental tissues, faeces, contaminated straw, wool, hair and hides	Animals do not normally display ill effects	Chills, fever, sweating, headache, loss of appetite, muscle soreness	Do not inhale or handle contaminated material (especially if you have open wounds)	Antibiotics (Tetracyclines), vaccine
LEPTOSPIROSIS *Leptospira interrogans* Bacteria	Terrestrial mammals; particularly rodents	Contact with urine of infected animals via broken skin, mouth or nose	Fever, loss of appetite, blood in urine	Headache, fever chills, muscle pain, stiff neck, jaundice, sensitivity to light, kidney malfunction	Strict personal hygiene, avoid contact with infected urine or contaminated water or soil	Antibiotics (Penicillins), hospitalisation
HYDATID DISEASE *Echinococcus granulosis* Tapeworm	Terrestrial mammals; wallabies, kangaroos, sheep	Dogs and dingoes harbour adult worms, host develops cyst from ingesting eggs from faeces	Organ and bone damage by cyst	Cyst in brain (nervous signs), lungs (difficult breathing, cough), kidneys, nausea after meals, coughing, jaundice. Rupture of cysts can be fatal	Strict personal hygiene, do not allow dogs to feed on carcasses. Wash hands thoroughly after touching dogs or handling offal	X-ray, Surgery, anti-parasitics
CAMPLYLOBACTER AND SALMONELLA *Campylobacter* and *Salmonella* Bacteria	Terrestrial mammals, birds, reptiles	Handling sick animals, carcasses, contaminated food or water	May not show symptoms	Abdominal pain, diarrhoea, fever	Strict personal hygiene, disinfection of equipment and cages, protect food and water from contamination by excreta	Rest, fluids
PSITTACOSIS (ORNITHOSIS) *Chlamydia psittaci* Bacteria-like organism	Birds (especially parrots)	Inhalation of faecal dust in aviary, transport boxes	Difficulty breathing, fever, diarrhoea, loss of appetite, weight loss, conjunctivitis	Loss of appetite, chills, fever, headache, sensitivity to light, throat irritation, breathing difficulty, weight loss	Avoid contact with infected birds, aviary dust, disinfect aviary and transport boxes	Blood test, x-ray, antibiotics (Tetracyclines, Doxycycline)

Disease and causative organism	Animals involved in transmission	Method of transfer	Animal Symptoms	Human Symptoms	Possible method to reduce risk	Diagnosis and treatment
MURRAY VALLEY ENCEPHALITIS *Arbovirus* Involving insect vector	Carried by birds, terrestrial mammals, marsupials, dogs	Spread by mosquito bites	Chickens and waterfowl (herons, cormorants) carry the disease, but do not show symptoms	Headache, fever, stiff neck, loss of appetite, giddiness, drowsiness, brain damage	Avoid mosquito bites, insect repellent, wear long pants and sleeves, stay indoors at dusk	Intensive care, artificial respiration
ROSS RIVER VIRUS *Arbovirus* Involving insect vector	Carried by kangaroos, wallabies, possums, flying fox and native rodents	Spread by mosquito bites	Animals do not show symptoms	Rash, rheumatism, swelling and pain in joints, chronic fatigue	Avoid mosquito bites, insect repellent, wear long pants and sleeves, stay indoors at dusk	Rest, pain killing drugs
ERYSIPELOID *Erysipelothrix rhusiopathiae* Bacteria	Marine mammals, dolphins, whales, seals, fish, malleefowl, tawny frogmouth, emu	Skin contact with infected animals or via mouth, ticks and mites	Fever, exhaustion, inflammation of eyelids, vomiting, joint pain	Enlarged red or purple skin eruptions, local joint pain, septicaemia, fever, headache, lethargy	Avoid skin contact with infected animal or carcass, disinfect equipment and cages, wash hands after contact	Antibiotics
MYCOBACTERIOSIS / NOCARDIOSIS *Mycobacterium bovis, M. avium,* *M. marinum* Bacteria	Marine mammals, fish, marsupials, reptiles, birds	Aerosol or skin contact with infected animal or carcass, abrasions when swimming, faecal exposure	Cyst, abscess, ulcer, weight loss, coughing, loss of appetite	Cough, chest pain, chills, fever, fatigue, ulcers, abscesses on hands and fingers	Strict personal hygiene, avoid skin contact with infected animal or carcass, disinfect equipment and cages, wash hands after contact	Blood test, skin test, oral drugs, antibiotics (Rifampicin, Ethambutol, Streptomycin)
LYSSAVIRUS Virus related to rabies	Insectivorous bats and fruit bats	Contact with exposed tissue, nerves or mucus membrane from bites and scratches and blood and urine of infected animals, long incubation period (e.g. a case of 27 months delay has been recorded)	Muscular weakness (partial paralysis of wing or hind limb), difficulty or inability to fly, salivation, unusually docile or unusually aggressive, depressed and unresponsive	Headache, malaise, sensory change around bite or scratch site, fever, excitability, an aversion to fresh air and water, weakness, delirium, convulsions and coma	Avoid contact with animals, wear bite proof gloves, facemask and full protective gear, cover open wounds, scratches, sores	Laboratory testing of skin, blood and spinal fluid, rabies vaccine, booster vaccinations for at-risk groups

Disease and causative organism	Animals involved in transmission	Method of transfer	Animal Symptoms	Human Symptoms	Possible method to reduce risk	Diagnosis and treatment
BRUCELLOSIS *Brucella abortis*	Seals	Secretion from wounds, urine and other body fluids into open wounds and grazes on skin.	Animals do not normally show symptoms (abortion).	Fever, weakness, sweats, muscle and joint aches and pains (flu-like)	Strict personal hygiene, avoid skin contact with infected animal or excretions, wear protective clothing, wash hands after contact	Antibiotics (Doxycycline, Streptomycin)
ASPERGILLOSIS *Aspergilla spp.* Fungal mould	Birds, especially stressed sea birds	Inhalation from air, feather dust etc.	Difficulty breathing, cough	Difficulty breathing, cough, meningitis, skin infections	Strict personal hygiene, avoid skin contact with infected animal, wear masks, gloves protective clothing, wash hands after contact	Antifungals (Amphotericin B)
TOXOPLASMOSIS *Toxoplasma gondii* Parasite worm	All mammals and birds can have cysts in muscles, Cats excrete in faeces	Ingestion via contamination of skin, food with faeces or cysts in raw meat.	Animals may not show symptoms	Abortion, birth deformities, possible cyst formation in important organs (e.g. liver, lung, brain), may remain hidden in healthy people	Strict personal hygiene, avoid skin contact with infected animals/faeces, wear gloves when handling raw meat	Blood test, Antibiotics for pregnant women or those who develop symptoms

Note: other fungal infections such as ringworm, or parasites such as scabies mite *Sarcoptes scabeii* can be transmitted to humans and require similar precautions when handling wildlife. Any open wound can also result in tetanus from infection with *Clostridium tetani*, which is prevalent in the environment. All CALM Personnel working with animals should maintain vaccination coverage against tetanus and those working with bats should be vaccinated against lyssavirus.

Appendix III. Decision making chart for sick, injured or orphaned wildlife



Appendix IV. Table of euthanasia techniques for field conditions

Injectable chemical agents should be used to euthanase animals wherever possible. However, if the equipment required to give a lethal injection is not on hand and/or trained personnel are not available to administer the injection, physical methods of euthanasia or inhalants must be used. The methods for euthanasia of animals outlined below and in the following tables are based on laboratory testing to establish the most humane and ethical methods of euthanasia under field conditions (Reilly 2001).

After using a euthanasia technique on an animal, it is essential to establish that the animal is dead before disposing of the carcase. This can be difficult for some animals such as reptiles and amphibians. Several signs can be used to establish that death has occurred including: absence of breathing; absence of a heart beat and a pulse; loss of colour (changing from pink to white or grey/blue) in the mucous membranes; no corneal reflex or response by the eyelid when stimulated and glazing of the eyes. If there is any doubt about confirmation of death, a second method should be used to kill the animal to ensure it is dead.

The following table 'RECOMMENDED TECHNIQUES FOR THE HUMANE EUTHANASIA OF ANIMALS BY CALM PERSONNEL UNDER FIELD CONDITIONS' is designed as a quick reference summary. **The table must never be used in isolation** and must be used only in conjunction with the explanatory information in Appendix V. The boxes that have been left blank represent those techniques that have not been assessed or where no recommendation has been made by Reilly (2001).

RECOMMENDED TECHNIQUES FOR THE HUMANE EUTHANASIA OF ANIMALS BY CALM PERSONNEL UNDER FIELD CONDITIONS						
	Technique: ☑ Recommended ☒ Not recommended					
	Stunning or anesthesia followed by				**Carbon dioxide inhalation**	**Shooting**
Species	**Blunt trauma**	**Cervical dislocation**	**Decapitation**	**Spinal severance and brain destruction**		
Rabbits	☑	☑	☑		☑ Baby up to 3 weeks	☑
Dingoes/Dogs	☑				☑ Pups	☑
Cats	☑				☑	☑
Bats	☑	☑	☑ Neonates only		☑	
Small mammals	☑	☑	☑ Neonates only		☑	☒
Kangaroos and wallabies	☑	☑ Pouched young	☑ Pouched young		☑ Quokkas only	☑ Brain shot
Birds	☑	☑ Chicks, small and medium sized adults only	☒		☑ Chicks, small and medium sized adults only	☑ Large species 3kg and over only
Lizards and snakes	☑	☒	☒	☑	☒	☒
Tortoises and turtles	☑	☒	☑		☒	☒
Crocodiles	☑ Juveniles	☒	☑ Juveniles	☑ Juveniles	☒	☑ Brain shot only
Amphibians	☑	☒	☑	☑	☒	☒
Fish	☑	☑ Small fish only	☑	☑	☒	
Mice and rats	☑	☑ Animals over 150g must be stunned first	☑ Neonates only		☑	☒
Cetaceans, sirenians and pinnipeds	☒	☒	☒		☒	☑ Brain shot only for small species ☑ Explosives for large species

Appendix V. Euthanasia techniques for field conditions

Injectable chemical agents

Injectable solutions such as Pentobarbitone sodium can be used for humane euthanasia or voucher collection of small to medium vertebrates (mammals, birds and reptiles). Euthanasia solutions can only be administered by CALM personnel who hold a current licence issued by the Department of Health and who have presented a letter from a practising veterinary surgeon, attesting to their competency, to the CALM Animal Ethics Committee. These personnel must be trained in the correct dose rates, injection procedures and procedures for storage and safety. Contact the CALM Animal Ethics Committee for information on training and accreditation in the use of injectable euthanasia solutions.

Freezing

Freezing alone is an unacceptable form of euthanasia for vertebrates, but cooling (to 3-4°C) can be used to facilitate handling of reptiles and amphibians. Reptiles, amphibians and invertebrates may be euthanased by cooling in an ice bath prior to freezing.

Stunning

The aim of stunning is to produce immediate unconsciousness. Stunning must be followed by blunt trauma, cervical dislocation, decapitation, spinal transection and brain destruction.

Mice are held by the tail and swung in an arc so that the back of the head only contacts a bench or hard surface. Rats are held by the hindquarters and brought downward so that the back of the head only contacts a bench or hard surface.

Blunt trauma

This is a hard sharp blow to the base of the back of the skull with a blunt metal or heavy wooden bar. Blunt trauma is used to euthanase reptiles, amphibians and small to medium sized mammals.

Note: this method can lead to undesirable damage to key body parts that are important for taxonomic studies. If the head must be preserved intact, an alternative technique should be used.

Cervical dislocation

Involves holding the animal prostrate on a solid surface with the thumb and forefinger of the operator firmly squeezing the neck behind the head of the animal. The hindquarters are grasped firmly with the free hand and pulled caudally away from the head. An instrument such as scissors or a steel rod can be used in place of the thumb and forefinger.

For birds, the legs are taken in the left hand and the head held between the first two fingers of the right hand with the thumb under the beak. A sharp jerk with each hand, pulling the head backward over the neck will break the spinal cord and carotid arteries.

Cervical dislocation should be preceded by stunning whenever possible.

Decapitation

Decapitation should be effected with the use of a sharp, heavy blade such as a cleaver or an axe. Decapitation is un-aesthetic and should be preceded by stunning.

Spinal severance and brain destruction

Spinal severance involves severing the spine behind the head at the base of the skull. The spinal cord must be severed between the skull and the first

cervical vertebra. This must immediately be followed by brain destruction by inserting a rod into the brain (pithing).

Carbon dioxide inhalation

Carbon dioxide is a rapidly acting gas that can be used with minimal handling of the animals. The use of carbon dioxide to euthanase animals requires specialised equipment and training.

Shooting and explosives

Shooting requires specialised equipment and must only be carried out by the holder of an appropriate firearm licence. The recommended procedures, firearms and cartridge and shot specifications for the ethical and humane shooting of animals are shown in Appendix VI and Appendix VII

Explosives are sometimes used to euthanase large cetaceans if there is no viable alternative. The handling and use of explosives must be carried out by the holder of a shot-firer's licence, issued by the Department of Minerals and Energy, under the provisions of the *Explosives and Dangerous Goods Act 1961.*

Appendix VI. Shooting techniques

Shooting kangaroos

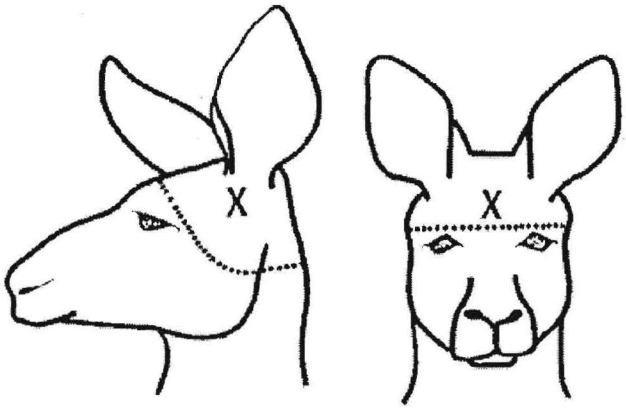
The following information is taken from the *Code of Practice for the Humane Shooting of Kangaroos* (1998) Department of Environment and Heritage.

Animals must not be shot from a moving vehicle or platform. The animal must be clearly visible, stationary and within the ranges specified in the tables below. The shooter must always aim for a brain shot, but if this is not practical (for example where the animal is injured or wounded, or where the head must be preserved as part of a research program) a heart shot may be required. The most humane and ethical targets for the brain shot and heart shot are described below.

Brain shot

Front view: Aim horizontally at the point of intersection of lines taken from the base of each ear to the opposite eye. This method is acceptable for younger animals, but not older animals (especially those that engage in head butting confrontations) because the frontal bones are very dense in older animals and the shot may not penetrate the skull.

Side View: Aim horizontally from the side of the head at a point midway between the eye and the base of the ear. This approach is preferred for mature or old animals that have developed dense frontal bone structures.



Note: A shot to the side of the head is preferred because it offers a larger target area.

Heart shot

Front View: Aim horizontally at the mid point of the chest midway between the forelegs and immediately below the base of the throat. Frontal chest shots should only be used for animals in the 'head high' position.

Side View: Aim horizontally at the centre of a line encircling the minimum girth of the animal, immediately behind the forelegs. The ideal side-on heart shot is taken from an angle slightly to the rear of the target animal's shoulder. This angle of aim is taken because the shoulder blade (scapula) provides partial protection of the heart from a direct side on shot.

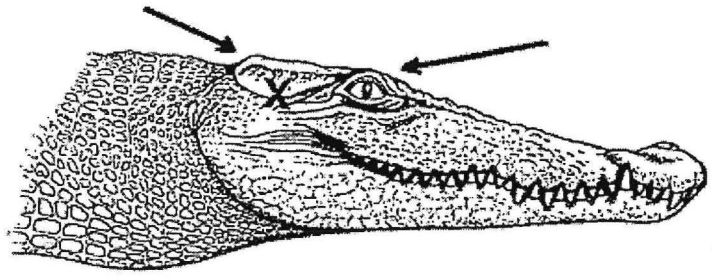
Shooting crocodiles

The following information is taken from the *Draft Code of Practice on the Humane Treatment of Captive and Wild Crocodiles* (2005) Australian Government.

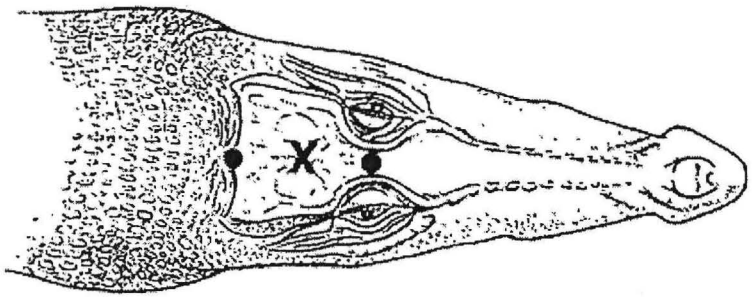
Crocodiles of any size may be shot through the back or side of the cranial platform, or between the eyes. A rifle should be used and the spinal cord must then be severed between the skull and the first cervical vertebra as soon as possible after shooting. Shotguns would only be suitable with "solids" at very close range (5-10m).

The point of aim when shooting a crocodile should be the brain, which lies under the cranial platform (see diagrams). The crocodile should be stationary and within a range that permits accurate placement of the shot. On recovery of the crocodile, the spinal cord must be severed (between skull and first vertebra).

Side View: for a shot to the side of the head, and location of the brain. Arrows indicate preferred trajectory for a shot to the back or front of the head.



Dorsal View: showing location of the brain (x). Points of aim for shots to the back or front of the head.



Appendix VII. Calibre, shot sizes and ranges for shooting animals

The following information is modified from Ethics, animal welfare and operation guidelines for the humane shooting of pest animals (1991). Agriculture protection Board of Western Australia Infonote 8/91.

Recommended calibre and ranges for the use of firearms to shoot animals			
Species	**<30m**	**30-100m**	**>100m**
Camel	.243, .308	.308	.308
Donkey	.243, .308	.308	.308
Pig	.44 Mag., 12 Gauge	.44 Mag., ≥.243	≥.243
Kangaroo	≥.222	≥.222	≥.222
Goat	≥.222	≥.222	≥.222
Dingo/Dog	.17, .22 Hornet, 12 Gauge	≥.222	≥.222
Cat	.17, .22, 12 Gauge	≥.222	≥.222
Fox	.17, .22 Hornet, 12 Gauge	≥.222	≥.222
Rabbit	.17, .22, 12 Gauge	.17, .22 Hornet	.22 Hornet
Emu	.44 Mag., 12 Gauge	≥.222	≥.243
Parrots and cockatoos	.22, .410 or 12 Gauge	≥.22	☒
Small Birds	.22, .410 or 12 Gauge	☒	☒

Recommended minimum sizes for shot for various birds			
Species or Group	**Calibre/ gauge**	**Shot size or type**	**Shot charge Wt. g. (ozs)**
Silvereyes	.410 gauge	10	32g (1.1/8)
Starlings & Sparrows	12 gauge .22	8-9 long rifle	32g (1.1/8)
Parrots	12 gauge .410 gauge .22	7 4 Z long* / LR	32g (1.1/8) 14g (1/2) 29 gr /40 gr
Cockatoos	12 gauge .22	4 long rifle	32g (1.1/8)
Emus	12 gauge .222 .243	BB or heavier	32g (1.1/8) 50 gr 100 gr
* NOTE: Z long ammunition should not be used over distances greater than 15 m.			

Recommended minimum cartridge specifications for various animals				
Species	**Minimum Calibre or Gauge**	**Shot Size or type**	**Projectile Weight (Grains)**	**Remarks**
Camel	.243 .308		100 gr 165 gr	Soft Nose Soft Nose
Donkey	.243 .308		100gr 165 gr 150 gr*	Soft Nose Soft Nose Soft Nose
Pig	.243 .44 Mag 12 Gauge	 SG	90 gr 200 gr	Soft Nose Soft Nose
Kangaroos (all species)	.222 or .22/250		50 gr 53 gr	Soft Nose Soft Nose
Goat	.222		50 gr	Soft Nose
Dingo/Dog	.17 .22 Hornet .222 12 Gauge	 BB	25 gr 45 gr 50 gr	Hollow point Soft Nose Soft Nose
Cat Cat in cage trap	.22 .222 12 Gauge .22	 BB LR	40 gr 50 gr 40 gr	Hollow point Soft Nose Solid
Fox	.17 .22 Hornet 12 Gauge	 BB	25 gr 45 gr	Hollow Point Soft Nose
Rabbit	.17 .22 12 Gauge	 4	25 gr 40 gr	Hollow Point Solid
Crocodile 1.5-3.0m long > 3.0m long	.222, .243, .270 .308		50 gr, 100 gr 150 gr / 165 gr	Soft Nose or Power Point
* NOTE: Ammunition used in 7.62 mm SLR's should be 165 gr. for large animals and 150 gr. for feral goats.				