



Home Office

Advisory Standards

Republished from the 2014 Code of Practice for
the Housing and Care of Animals Bred, Supplied
or Used for Scientific Purposes

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Introduction

1 Background

This document is a republication of the advisory standards (section 3) of the 2014 Code of Practice for the Housing and Care of Animals Bred, Supplied or used for Scientific Purposes (CoP). The 2014 CoP has been superseded by the 2026 version, where only the current mandatory legal standards have been retained for clarity. Section 3 of the 2014 CoP is republished here to ensure that the advisory material remains available for reference.

This document provides information that may be used alongside requirements in the CoP, providing advice covering a broader range of subjects and further detail on how legal minimum standards can be met and exceeded.

At the time of publication, the Home Office is reviewing its approach to leading practice following advice from the Animals in Science Committee. The Home Office is exploring a more dynamic approach to leading practice, avoiding the need to link standards that may require regular updates to a statutory document. Further guidance on this will be provided in due course.

2 How will this document be used?

The purpose of this document is to promote a shared understanding between Establishments and Home Office Inspectors of the manner in which the requirements of the CoP might be met. In addition, the advice seeks to encourage establishments to promote high quality animal welfare and high-quality science, which may go beyond the minimum requirements, where applicable.

Home Office Inspectors may utilise the advice in this document to discuss and encourage best practice. With advances in welfare and science, leading practice evolves. Establishments should seek to continually improve their standards of care and accommodation in line with the principles of the 3Rs, striving to achieve better welfare outcomes, where practicable and applicable.

Whilst there is no legal requirement to make provisions above the minima in the CoP, demonstration that an establishment has given due consideration to the advice in this document or other relevant, evidenced-based advice would provide *positive* evidence of a good culture of care at that establishment. Other indicators are also important in demonstrating the culture of care at an establishment.

Where an Inspector has significant concerns about animal welfare and/or the quality of science at a particular establishment, they may utilise the advice in this document, as well as other sources of expert opinion, to assist in identifying how welfare or scientific outcomes may be improved.

3 This Document's legal status

3.1 Mandatory vs advisory

This document does not set any mandatory standards. This advice is intended to assist in the interpretation and application of the mandatory minimum standards set out in the Code of Practice (CoP), offering direction on how these standards may be achieved and, where appropriate, surpassed.

It should be noted that this advice is consistent with the standards articulated in the CoP and does not override or contradict them. Rather, it provides supplementary advice including guidance relating to protected species absent from the CoP, as well as further information on the practical implementation of CoP standards.

3.2 Audits

During establishment inspections, Home Office Inspectors will assess against the standards outlined in the CoP. Home Office Inspectors may also utilise the advice in this document to discuss best practice OR where species specific information is lacking from the CoP. See section 4 of this introduction for further details on how this document may be used in inspections.

Glossary

Animals in Science Committee (ASC)	The independent non-departmental public body set up under ASPA sections 19 and 20. It is responsible for providing impartial, balanced and objective advice to the Home Office on issues relating to ASPA.
AWERB	Animal Welfare and Ethical Review Body. Every licensed establishment is required by ASPA to have an AWERB. Its membership and activities are defined by ASPA.
Body condition	See condition scoring.
Brooder lamp	A heat lamp with a controllable or known temperature output.
Condition scoring	An objective system of evaluating an animal's body condition (amount of stored fat) and assigning a numeric value.
Conspecifics	Belonging to the same biological species.
Cubicle	Individual cow bedding spaces separated by half height and half length partitions. Usually located in loose housing cow accommodation in which the cow is free to wander at will.
Enclosure	The primary accommodation in which the animal is confined, for example a cage, pen, run or stall. It is the extent to which the enclosed animal can freely range.
Environmental enrichment	The practice of providing animals under managed care with stimuli such as natural and artificial objects which promote the expression of species-appropriate behavioural and mental activities.
Establishment	A place holding a licence that has been granted under section 2C of ASPA.
Establishment Licence (PEL)	A licence granted to a place under section 2C of ASPA.
Fill and dump system	A water cleaning system where there is no through flow of water. A proportion of water volume is extracted and replaced at regular intervals in order to keep the aquatic environment healthy. The volume and frequency of the exchange depend on the species requirements.
Flow system	A continuous matched top up and outflow of water in and out of tanks in order to keep the aquatic environment healthy.
Floor area	The footprint of the enclosure. Whether or not shelving may contribute to floor area varies according to the species being kept and the space below the shelf. For more information, please see Chapter 1 of the CoP: Advice applicable to all animals.
Group housed	Housed as two or more animals within the same enclosure.
Harem (guinea pig)	A group of guinea pigs – typically one male with one to ten females.
Headweaving	A stereotypical behaviour where the animal repeatedly moves its head from side to side, while keeping its body relatively still.
Health status	The presence or absence of infectious or non-infectious disease or abnormality in an individual or population.

Height	The vertical distance between the enclosure floor and the top of the enclosure floor area prior to the addition of enrichment devices.
Holding room	Secondary accommodation in which the animal enclosure(s) may be located, as specified in the schedule of premises of the Establishment Licence.
Inspector	An inspector in the Animals in Science Regulation Unit appointed under ASPA section 18.
Isolator	A device that creates a barrier in order to maintain an internal condition (e.g. sterile or aseptic).
IVC	Individually ventilated cage. A sealed cage unit attached to a dedicated air-handling system.
Mismothering	Failure of maternal behaviour that places the offspring at increased risk of suffering and/or harm.
NACWO	Named Animal Care and Welfare Officer.
Named Veterinary Surgeon (NVS)	A member of the Royal College of Veterinary Surgeons, specified by the Establishment, to advise on the health, welfare and treatment of the animals.
Open-water systems	Enclosures within a larger body of water, for example a pond, lake, river or the sea.
Pen	An area enclosed, for example, by walls, bars or meshed wire in which one or more animals are kept. Depending on the size of the pen and the stocking density, the freedom of movement of the animals is usually less restricted than in a cage.
Pet animal	An animal kept by a human as a source of companionship or pleasure.
POLE	Place Other than a Licensed Establishment.
Post-weaned stock	Young animals that have been weaned from the dam being kept for a licensed purpose.
Procedure	A licensed procedure causes pain, suffering, distress or lasting harm greater than or equal to the insertion of a hypodermic needle in accordance with good veterinary practice.
Procedure room	A room allocated for use for sterile and/or non-sterile procedures as specified in the schedule of premises of the Establishment Licence.
Production indices	Measurements of animal growth and production (e.g. milk production).
Project Licence (PPL)	A licence granted under section 5 of ASPA.
Protocol	A series of experimental steps defined in the Project Licence (PPL).
Re-use	The use of an animal in a protocol which has already been used in a previous protocol, where a naive animal could be used in its place. More information on re-use is available in the 'Guidance on the Operation of ASPA' available on the 'Research and Testing Using Animals' website.
Rooting	The natural behaviour of pigs and other animals to turn over soil or litter with their noses in search of edible matter.

Service room	A room within the facility which does not house animals and is not used for procedures, but contributes to the running of the facility, for example store rooms, cleaning and washing areas and waste management areas.
Single housed	Housed as one animal per enclosure, where other animals are not able to physically occupy the same space. This definition applies regardless of the degree of contact (e.g. sight or smell) that the animal may have with others.
Stud animal	An animal used for breeding only.
Supplying	Selling or passing on animals for a purpose regulated under ASPA.
Using	Using an animal for a purpose regulated under ASPA.
Wild animal	A species or animal that has never been cared for or farmed by humans, and is not descended from domesticated individuals.

Chapter 1: Advice applicable to all animals

1 The physical facilities

1.1 Functions and general design

When siting an animal house, consideration should be given to the activities in the adjacent buildings and any effect these may have on the welfare of the animals. An animal facility forming part of a larger complex should normally be designed to be self-contained. Wild, stray or pet animals should not be able to gain entry to any part of the animal house, including stores and personnel areas. Special care should be taken where drains and other services pierce the walls or floors to ensure that they have been properly proofed against rodents and other vermin.

Any special requirement for exercise or social contact for the species to be housed should incorporate adequate facilities sufficient for the activities carried out within it.

When substantial alterations to the premises are proposed, the Inspector should be consulted at an early stage.

1.1.1 Security

Facilities that are part of a larger building complex should also be protected by appropriate security and building measures and arrangements that limit the number of entrances. Advice should be taken about security from Crime Prevention Officers, from the local police or other experts during the design of new facilities or modifications of existing premises.

1.2 Holding rooms

The following are strongly recommended:

1. that all joints between door frames and walls etc. are sealed;
2. that floor-to-wall, wall-to-ceiling and wall-to-wall junctions are covered for easy cleaning;
3. that special attention is paid to junctions, including those with doors, ducts, pipes and cables;
4. where an inspection window is required in the door, that a flush fitted window is used to reduce maintenance;
5. that floors should be smooth, impervious and have a non-slippery (including when wet), easily washable surface, which can carry the weight of racks and other heavy equipment without being damaged;
6. that drains, if present, are adequately covered and fitted with a barrier, which will prevent vermin from gaining access or animals from escaping.

It is advisable to install services in such a way that they are either buried within the fabric of the building, boxed in or clear of the wall surface for easy cleaning. When the fabric of the building is penetrated, the holes created would normally be sealed.

It is recommended that holding rooms, where appropriate, have facilities for carrying out non-regulated procedures and manipulations.

Farm animals in pens generally require more robust wall and floor finishes. There should be no projections that could present a hazard to animals¹. Where no CoP standards exist, farm animals which are kept in animal houses should be given at least as much room as recommended in other relevant legislation and Codes of Practice, for example those produced by Defra. For some procedures the standards of environment and housing required may be much higher than where animals are kept under farm conditions. Exercise areas should normally be provided for larger farm

¹In order to meet the requirements of the 'CoP' Standards applicable to all animals

animals but, in some cases, such facilities may be impracticable from an experimental, environmental, disease control or security point of view.

It is advisable to avoid housing some species within sight, sound or smell of each other because of their natural predator-prey relationships. The decision to allow/avoid particular combinations using particular housing systems should be evidence-based.

1.3 General and special purpose procedure rooms

At breeding or supplying establishments suitable facilities for making consignments of animals ready for dispatch should normally be available.

Animals inoculated with infective agents that are transmissible to man or to other animals held on the premises should be contained within an area reserved for this purpose which has been designed, built and maintained in accordance with appropriate health, safety and biosecurity regulations.

It is advisable that regulated procedures, surgery or euthanasia are not performed in rooms where animals are normally housed or where other conscious animals are undergoing procedures, where this may cause additional avoidable stress to the animals. There should be separate preparation areas for animals, equipment and staff.²

Sick or injured animals should normally be housed separately, unless being separated from their normal social group is more detrimental than beneficial to their recovery. The advice of the veterinary surgeon responsible for the animals' treatment should be followed.

1.3.1 Surgical facilities

It is advisable that facilities used for aseptic surgery should meet the following minimum requirements.

- a. Surfaces and finishes within the surgical area should be designed so that they can be kept clean for use in sterile procedures.
- b. The surgical area should be large enough and arranged appropriately to allow correct aseptic technique.
- c. There should be separate areas for preparation of animals, surgery and recovery; these will preferably be separate rooms, although separate areas within the same room may be an appropriate alternative.
- d. There should be no open shelving in surgical areas. Ceiling-high wall cupboards or cupboards with sloped tops to prevent dust accumulation are preferred, should storage provision be essential.
- e. There should be a minimum of furniture in the surgical area so as to avoid the accumulation of dust and for ease of cleaning.

For detailed advice on aseptic technique, please see *LASA 2010 Guiding Principles for Preparing for and Undertaking Aseptic Surgery*.³

1.4 Service rooms

Special facilities may be required for storing and handling chemicals.

It is advisable that separate store-rooms and adequate space for clean cages, instruments and equipment are provided.

It is advisable that walls and floors are covered with a suitably durable surface material and the ventilation system has ample capacity to carry away the excess heat and humidity.

² Please see also the 'CoP' Standards applicable to all animals

³ *LASA 2010 Guiding Principles for Preparing for and Undertaking Aseptic Surgery. A report by the LASA Education, Training and Ethics section. (M. Jennings and M. Berdoy Eds)*
www.lasa.co.uk/publications.html (accessed 27/5/14).

If on-site incineration of waste material is not possible or necessary, it is advisable that suitable arrangements are made for the safe disposal of such material, having regard to national and local regulation and by-laws. Special precautions are required with toxic, radioactive or infectious waste.

It is advisable that the general design and construction of circulation areas corresponds to the standards of the holding rooms. Consideration should be given to the width of the corridors to allow easy circulation of movable equipment.

2 Environmental conditions

Environmental variables can have a significant impact on animal welfare. Furthermore, experimental results may be influenced by environmental conditions. Animals should be kept under conditions that favour a consistency of response to scientific procedures. Unstable environmental conditions are likely to introduce avoidable variability into biological responses. To demonstrate any experimental response against such a variable background generates a requirement for greater animal usage if the result is to be statistically valid. Good control of variables such as ventilation, humidity, temperature, lighting and noise can therefore contribute both to good science and to the minimisation of animal use.

It is advisable that measures are in place to ensure that breakdowns in equipment or systems controlling the environment are remedied promptly. Consideration should be given to maintaining a stock of critical spare parts.

Conditions should not be detrimental to the welfare of the animals, unless authorised by the project licence.

2.1 Engineering standards, performance and welfare

The species-specific chapters within this document AND the CoP.

provide suggested ranges for environmental parameters, for example temperature and relative humidity. The intention of providing these ranges is to indicate typical values that will normally satisfy the requirements of the CoP to provide “appropriate” environmental conditions.

However, whether the environmental conditions are or are not “appropriate” will ultimately be assessed by performance and welfare outcomes. Examples of indicators that may demonstrate unsuitable environmental conditions include, but are not limited to:

1. presence of respiratory disease in rats that may be attributable to low relative humidity;
2. decreased reproductive performance in mice that may be attributable to a noisy environment;
3. greasy coats in gerbils that may be attributable to high relative humidity;
4. increased aggressive behaviour in pigs that may be attributable to decreased environmental stimulation;
5. decreased growth rates in cattle that may be attributable to inadequate access to food of appropriate quality.

Where there is no impact on performance or welfare the ranges may be extended, with the agreement of appropriate named persons.

Even where the parameters in question are within the suggested ranges, if there appears to be, or may soon be an adverse impact on the animals, appropriate steps should be taken to adjust the parameters so as to avoid that adverse impact. Likewise, being within the suggested ranges *per se* does not necessarily guarantee that conditions are “appropriate” in every situation. Anticipation of potential welfare problems is as important as promptly dealing with them should they occur. Focussing on outcomes and solutions specific to your facility will ensure that your standards of accommodation and care are appropriate for your animals.

This principle should also be extended to other advice presented later in this document that could be interpreted as engineering standards.

2.2 Ventilation

The purpose of the ventilation system is to provide sufficient fresh air of an appropriate quality and to keep down the levels and spread of odours, noxious gases, dust and infectious agents of any kind. It provides for the removal of excess heat and humidity.

The air in the room should be renewed at frequent intervals. A ventilation rate of 15 to 20 air changes per hour of fresh or conditioned air distributed throughout the room is normally adequate for a fully stocked room of rodents or lagomorphs in open cages. However, in some circumstances, for example where stocking density is low, eight to ten air changes per hour may suffice. For cats, dogs and primates, 10 to 12 changes per hour may be adequate. In some cases, natural ventilation may suffice and mechanical ventilation may not even be needed. Re-circulation of untreated air should be avoided. However, it should be emphasised that even the most efficient system cannot compensate for poor cleaning routines or negligence. A smell of ammonia probably reflects overstocking, too little ventilation, inadequate cleaning, or a combination of these factors; the causes should be investigated and rectified. It is advisable that the optimum stocking density for each room for each species likely to be housed is calculated and readily available.

It is advisable that the ventilation system is designed so as to avoid harmful draughts and noise disturbance while delivering air as evenly as possible throughout the holding area. Please see paragraph 2.9 below for considerations for rooms holding Individually Ventilated Cages (IVCs), incubators etc.

The ventilation system can be used to create differential air pressures within the building as part of a "barrier system". "Clean" areas are generally maintained at higher pressure and "hazardous" areas at lower pressure than those adjacent to them to minimise the leakage of "dirty" air into "cleaner" areas and the escape of airborne hazards into the air outside the premises. This is effective only if the supply air is itself clean or is suitably filtered to be free from contaminants.

2.3 Temperature

The subsequent species-specific sections give the range within which it is recommended that the temperature should be maintained. It should also be emphasised that the figures given in these sections apply only to adult, normal animals. New-born, young, hairless, newly operated, sick or injured animals will often require a much higher temperature level. The temperature of the premises should be regulated according to possible changes in the animals' thermal regulation, which may be compromised due to special physiological conditions or to the effects of the procedures.

It may be necessary to provide a ventilation system having the capacity both to heat and cool the air supplied.

In user establishments precise control of the temperature experienced by the animal may be required, because the temperature is a physical factor which has a profound effect on the metabolism and behaviour of all animals, and therefore affects the validity of certain scientific outcomes. The target should be to maintain the temperature at which the animal is living in a band width of 4°C, the whole of the band lying within the optimal range indicated. For breeding in some species, however, a controlled daily fluctuation in temperature may be beneficial.

Outdoor areas provided for animals to exercise and interact cannot have strict temperature regulation.

2.4 Humidity

For some species, such as rats and gerbils, relative humidity may need to be controlled within a fairly narrow range to minimise the possibility of health or welfare problems, whereas other species, such as dogs, tolerate well wide fluctuations in humidity levels. As a general rule, prolonged periods below 40% or above 70% should be avoided.

2.5 Lighting

Exposure of some species or strains (especially albinos) to bright light should be avoided and darker areas for withdrawal should be available within the animal enclosures.

Consideration should be given to the inclusion of windows in holding rooms, since they are a source of natural light and can provide environmental enrichment for some species, especially non-human primates, dogs, cats, some farm animals and other large mammals.

The circadian “clock” of some species may be affected as much by light pulses of less than one second during the dark phase as by a long photoperiod; thus it may be important not to turn on lights during the dark period. On the other hand, intervals of darkness during the light period are far less disruptive. Where animals are maintained on reverse photoperiod, daily inspections of the animals should still be undertaken.

2.6 Noise

Noise can be a disturbing factor for animals. High noise levels and sudden noises can cause stress which, in addition to the welfare consequences for the animal, may influence experimental data. Background noise may be helpful in reducing the impact of unavoidable sudden noises.

Due consideration should be given to controlling noise levels within the hearing ranges of animals, including in some cases ultrasound (sound above the hearing range of the human being, conventionally taken to be sounds exceeding 20 kHz), particularly during their resting phase. This includes reducing noise due to human working practices as well as considering noise from equipment – for example alarms should be of a silent type. The layout of rooms and corridors can be major factors influencing the acoustic environment and this should be taken into account in their design.

2.7 Vibration

Animals such as rodents, amphibians and fish are very sensitive to vibration. Vibration can have a negative effect on reproductive efficiency and can have an influence on experimental results. It is therefore important to minimise vibration in the animal facility. For this reason, animal holding and procedure rooms should not be located adjacent to sources of vibration such as cage wash areas, lifts or busy corridors where cage racks are constantly being moved. Vibration is not normally an issue for large animals although minimising vibration may still be important in behaviour testing rooms.

Vibration is more likely to be an issue in animal facilities located in an upper level of a building rather than at ground level because of structural considerations. However, animals in ground floor and basement facilities may be affected by vibration arising from major structural projects. The potential impact of vibration should be carefully evaluated when considering the use of portable buildings.

2.8 Alarms

A technologically dependent animal facility is a vulnerable entity. It is strongly recommended that such facilities are appropriately protected to detect hazards such as fires, the intrusion of unauthorised persons, and the breakdown of essential equipment, such as ventilation fans, air heaters or coolers and humidifiers.⁴

Carefully designed monitoring, alarms and call-out procedures will ensure that any faults can be quickly identified and promptly rectified, and that the minimum number of animals is impacted for the shortest possible time by any fault.

Care should be taken to ensure that the operation of an alarm system causes as little disturbance as possible to the animals.

2.9 Special environments (e.g. Individually Ventilated Cages (IVCs), incubators, etc.)

Biocontainment systems (e.g. Individually Ventilated Cages [IVCs] and isolators but excluding filter top cages) are designed to ensure that the key environmental welfare issues are catered for. Thus, they should provide and maintain an appropriate environment in terms of temperature, relative humidity, air quality and air velocity (i.e. avoidance of draughts).

⁴ In order to meet the requirements of the 'CoP' Standards applicable to all animals

It is important that alarms and their management effectively detect and deal with any problems should they arise. The appropriate degree of complexity of the alarm and length of response time will be dependent on the biocontainment system and the species being kept in it.

In facilities in which the ventilation system is unable to provide suitable air quality, biocontainment systems may offer a less expensive alternative to complete refurbishment. However, in such cases all the other environmental parameters will still need to be considered. For example, unless IVCs are connected to a system that provides heating or cooling they will be totally dependent on the room temperature. Rooms should therefore be capable of providing air of an appropriate temperature and humidity. Where biocontainment systems are used in rooms that do not meet code of practice requirements, particular consideration needs to be given to the potential for failure of the biocontainment unit itself, as failure in these circumstances is likely to have a greater/more rapid adverse impact on animal welfare.

2.10 Emergency response planning

Carefully considered contingency planning and emergency response plans are central to the management of the animal facility⁵. There are a number of aspects that should be thought through including what happens in the event of a major incident to the facility or locality (e.g. loss of power or water) and how emergency animal care and accommodation can be provided. However, in some cases the facilities or programme of work may be so compromised that destruction of the animals needs to be considered to prevent significant welfare issues developing. Therefore, plans should normally include arrangements for the emergency evacuation, housing, husbandry (including feeding and watering), and, where inevitable, the killing of animals. These plans should normally include assessments of the risks, their likelihood and mitigations as well as actions to be taken, by whom, in the event of temporary, longer-term disruption or catastrophic facility failures. They should normally reflect the requirements for the care of animals as described in Part 4 below.

3 Education and training

All persons handling animals or directly involved in caring for animals being bred, held or used for experimental or other scientific purposes should be appropriately educated and trained to the standard described in Section 9 of the Guidance on the Operation of the Animals (Scientific Procedures) Act 1986.

4 Care of animals

Animals within an animal facility are totally dependent on humans for their health and well-being. The physical and psychological state of the animals will be influenced by their local environment, food, water and the care and attention provided by the animal care staff and scientific personnel.

4.1 Supervision of procedures

Unconscious animals (i.e. where a protective gag reflex is absent) should be closely monitored. This includes animals undergoing imaging, in warming facilities, undergoing surgical preparation or during or after surgery.

4.2 Health

Animals of an appropriate known health status are an essential prerequisite for good animal welfare and good science. Intercurrent infection in the animal population may call into question the validity of information obtained from scientific procedures and make interpretation of results impossible.

The aim is to maintain animals in good health and physical condition, behaving in a manner normal for the species and strain and with a reasonably full expression of their behavioural repertoire, and amenable to handling.

⁵They are likely to be necessary to meet the requirements of Sections 1 and 2 Chapter 1 Standards applicable to all animals, paragraph 2.4.

The person responsible for the establishment should ensure regular inspection of the animals and supervision of the accommodation and care by a veterinarian or other competent person, normally a NACWO.

Should behavioural or breeding problems occur or should further information on specific requirements for other species be required, advice should be sought from experts specialised in the species concerned and care staff or veterinary surgeon, to ensure that any particular species' needs are adequately addressed.

Regular health monitoring of all animals should be carried out, comprising the daily check, plus ongoing monitoring and evaluation to enable prompt interventions to safeguard the health of individuals and populations, as appropriate to the species and situation. Animals which are undergoing scientific procedures should be inspected at a frequency commensurate with the severity of the procedure and/or potential rate of change of the condition of the animal, and never less than once per day.

Because of the potential risk of contamination of animals and staff presented by the handling of animals, it is advisable that particular attention is paid to the institution of hygiene procedures and supervision of staff health.

4.3 Separation from the mother

Early weaning from the mother – if it may cause pain, suffering, distress or lasting harm – may be a regulated procedure. In such circumstances the Home Office should be consulted regarding whether Project Licence authority is required.

4.4 Transport of animals

4.4.1 Legislation and responsibilities

Prior to entry to a licensed establishment, an animal's welfare during transport is governed by applicable international, EU and UK law⁶. The enforcement authority in England, Wales and Scotland is the Animal and Plant Health Agency (APHA), and in Northern Ireland the Department of Agriculture and Rural Development.

Once an animal enters a licensed establishment and becomes a protected animal under ASPA its welfare during any subsequent transport is *additionally* regulated under ASPA. Both project licence holders and establishment licence holders have responsibilities relating to transport of protected animals⁷.

Under ASPA, the person legally accountable for the transport of the animals (the sending establishment licence holder) has the overall accountability for the planning, carrying out and completion of the whole journey, regardless of whether duties are subcontracted or delegated to other parties during transport. The sending establishment licence holder should check that all necessary arrangements are in place to fulfil standard condition 4(6) of their establishment licence – namely that the conditions under which a protected animal is transported are appropriate for the animal's health and well-being.

Once the animals have been received at their destination, legal accountability for their care transfers to the receiving establishment licence holder, or, in the case of establishments that are not licensed, the animal is discharged from ASPA.

The person in charge of the welfare of the animals has direct physical responsibility for the care of the animals during transport. Such a person may be the attendant or the driver of a vehicle if fulfilling

⁶ *Animals should be transported in accordance with the principles of the European Convention on the Protection of Animals during International Transport (ETS No. 65 and ETS No. 193), having regard to the Resolution on the acquisition and transport of laboratory animals, adopted by the May 1997 Multilateral Consultation of the Parties to Convention ETS No. 123 and, to EU Regulation (EC) 1/2005 on the protection of animals during transport, implemented in England by The Welfare of Animals (Transport) (England) Order 2006 and by parallel legislation in Scotland, Wales and Northern Ireland.*

⁷ *Establishment Licence Standard Conditions 4(6), 23(a) and 23(b). Project Licence Standard Condition 24(a) and section D of the licence itself.*

the same role. It is considered good practice for the person in charge of the welfare of animals being transported to be aware of the special needs of the animals in their care.

4.4.2 Journey planning

For animals, transportation is a stressful experience which should be mitigated as far as possible. The following principles should apply to all animal movements, from short journeys by vehicle within scientific establishments to international transportation.

It is advisable that the route is planned in order to ensure that the transport is carried out efficiently to minimise journey time, from loading to unloading, and to avoid delays in order to limit any stress and suffering of the animals. Care is needed to ensure that animals are maintained under suitable environmental conditions for the species, and that measures are taken to minimise sudden movements, excessive noise, or vibration during transport. Both sender and recipient should agree the conditions of transport, departure and arrival times to ensure that full preparation can be made for the animals' arrival.

It is advisable that containers for travel:

- a. confine the animals in comfortable hygienic conditions with minimal stress for the duration of the journey;
- b. contain sufficient food and water or moisture in a suitable form;
- c. contain sufficient bedding so that animals remain comfortable and in conditions close to their thermo-neutral zone;
- d. be of such a design and finish that an animal will not damage itself during loading, transport and whilst being removed from the container;
- e. be escape-proof, leak-proof and capable of being handled without the animals posing a risk to handlers;
- f. be designed to prevent or limit the entry of micro-organisms, where appropriate;
- g. be designed so that they can be thoroughly disinfected between shipments, if intended to be reusable;
- h. allow sufficient ventilation;
- i. allow visual inspection of the animals without compromising their microbiological status (where appropriate);
- j. be clearly labelled.

4.4.3 Dispatch

The sender should ensure that the animals are examined and found to be fit for transport before being placed in the transport container. Animals that are incompatible should be appropriately separated for transport.

Animals that are sick or injured should not normally be considered fit for transport, except for those whose sickness or injury is such that transport will not cause additional suffering, or where the transport is under veterinary supervision for, or following, veterinary treatment.

Sick or injured animals may also be transported for experimental or other scientific purposes approved by the Home Office if the illness or injury is part of the research programme. No additional suffering should be imposed by the transport of such animals, and particular attention should be paid to any additional care which may be required. A competent person, normally a veterinarian or NACWO, should confirm that such animals are fit for the intended journey. Pregnant and post partum animals (and their offspring) need special care.

4.4.4 Reception

It is good practice to ensure that on arrival at their destination the animals are removed from their transport containers and examined by a competent person, normally a veterinarian or NACWO, with the least possible delay. It is recommended that after inspection, the animals are transferred to clean cages or pens and supplied with food and water as appropriate.

Animals which are sick, injured or otherwise out of condition, should be examined by a veterinary surgeon. These animals should be provided with veterinary treatment as appropriate or, if deemed necessary, promptly killed by a humane method, in line with the principles set out in Section 6 of the Guidance on the Operation of the Animals (Scientific Procedures) Act 1986.

4.5 Quarantine, acclimatisation and isolation

The objectives of quarantine and isolation periods are:

- a. to protect other animals in the establishment;
- b. to protect man against zoonotic infection; and
- c. together with an acclimatisation period, to foster good scientific practice.

According to the circumstances, these periods may vary and are either determined by national regulations or a competent person, normally the NVS.

4.5.1 Quarantine

Quarantine is defined as a period of housing newly introduced or reintroduced animals separately from existing animals in the establishment to establish the state of health of the animals and to prevent the introduction of disease. Such a period is recommended when the health status of the animal is not known.

4.5.2 Acclimatisation

A period of acclimatisation is usually needed to allow animals to recover from transport stress, to become accustomed to a new environment and to husbandry and care practices. Even when the animals are seen to be in good health, it is strongly advisable for them to undergo a period of acclimatisation before being used in a procedure. The time required depends on several things, such as the stress to which the animals have been subjected. This in turn depends on several factors such as the duration of the transportation, the age of the animal and degree of change of the social environment. It should also be taken into account that international transport may necessitate an extended period of acclimatisation due to disturbance of the diurnal rhythm of the animals. Acclimatisation periods should be agreed by the NVS, NACWO and investigator to ensure good animal welfare and science outcomes.

4.5.3 Isolation

A period of isolation of diseased animals is intended to reduce the risk of infecting other animals or humans. It is advisable to house separately or in isolation any animal suspected of posing such a risk, for an appropriate period of time.

4.6 Housing and enrichment

Restricted environments can lead to behavioural and physiological abnormalities and affect the validity of scientific data. It is a requirement that animals should be able to exercise "a degree of choice over their environment"⁸. This could be achieved, for example, by having a variety of resting places in the enclosure, or by the animal being able to construct its own nest or resting place.

Consideration should be given to the potential impact of the type of accommodation, and that of the environmental and social enrichment programmes, on the outcome of scientific studies, in order to avoid the generation of invalid scientific data and consequential animal wastage.

⁸ Please see also the 'CoP' Standards applicable to all animals

It is recommended that the design of housing and enrichment strategies should take into account the need to observe the animals with minimum disruption and to facilitate handling. Consideration should be given to the potential conflict between the need for regular observation of animals and the importance of avoiding disturbances that may have a negative impact on their welfare. Mandatory minimum animal enclosure sizes and space allowances are included for most species routinely used in research programmes in the CoP.

The shape of the enclosure and the furniture provided may be as important to the animal as overall size. Room should be allowed for growth of the animals. Some animals continue to grow into old age although they may become less active.

Unless otherwise specified, additional surface areas provided by enclosure additions, such as shelves and mobile enrichment devices, should be regarded as being in addition to the recommended minimum floor areas.

Single housing should only occur on animal health or welfare grounds, unless it is permitted by Project Licence authority. The need for single housing on health or welfare grounds should be agreed with a competent person, normally a veterinarian or NACWO. There are some occasions when stud males need to be housed singly (e.g. to prevent fighting). In such circumstances, additional resources should be targeted to the welfare and care of these animals. In such cases, the duration should be limited to the minimum period necessary and, where possible, visual, auditory, olfactory and tactile contact should be maintained where appropriate to the species, strain and sex. The possibility of social housing can be promoted by purchasing compatible individuals when procuring animals of gregarious species.

Consideration should be given to housing animals so that they can be easily inspected. Some procedures may require a more restrictive system of housing to cater for special requirements imposed by experimental procedures, for example, the need to collect excreta or expired air, or the use of radioactive isotopes. Such housing should be used for the minimum time only and be authorised as appropriate.⁹

As animals grow, the adequacy of the housing or enclosure, in particular in relation to size and area, should be monitored to ensure that it continues to meet the requirements described in the Code of Practice.

4.6.1 Enrichment

In addition to social activities, enrichment can be achieved by allowing and promoting physical exercise, foraging, manipulative and cognitive activities, as appropriate to the species. It is advisable to allow the animals to exercise at every possible opportunity. Forms of enrichment should be adaptable so that innovation based on new understanding may be incorporated.

It is strongly recommended that the staff responsible for animal care understand the natural behaviour and biology of the species, so that they can make sensible and informed choices on enrichment. They should be aware that all enrichment initiatives are not necessarily to the advantage of the animal and therefore should monitor their effects and adjust the programme as required.

4.7 Feeding

The behavioural requirements for some species include foraging, so for animals of these species it is strongly advised that the opportunity for foraging is given. Roughage is an important component of the diet for some species of animals, as well as a means of satisfying some behavioural needs.

It is recommended that food is packed in containers that provide clear information on the identity of the product and its date of production. Where a commercially manufactured product is used, an expiry date should be clearly defined by the manufacturer. It is strongly advised to adhere to such expiry dates.

⁹ Please see also the 'CoP' Standards applicable to all animals

Store-rooms should normally be cool, dark, dry, adequately ventilated and vermin and insect-proof. It is advisable to store perishable food like greens, vegetables, fruit, meat and fish in cold rooms, refrigerators or freezers.

If moist food is used, or if the food is easily contaminated with for example water or urine, daily cleaning is normally necessary.

In some circumstances, food intake may need to be controlled to avoid obesity.

Where withholding of food is necessary for experimental or safety reasons, such as prior to anaesthesia, care should be taken that deprived animals are not stressed by exclusion from food whilst other animals around them are fed. Removing deprived animals to another cage or room may be less stressful than leaving them with the fed animals.

Consideration should be given to providing diets for disease-free animals that have been treated to destroy vegetative organisms, parasites, pests and spores. Autoclaving or irradiation may be required. Where special diets containing chemicals for testing have been used, the nutritional consequences of the preparation and storage of the diet should be considered.

4.8 Watering

Water is a vital resource to all animals. However, water is also a potential vehicle for micro-organisms, and due consideration should be given to arranging the supply so that the contamination risk is minimised. It is important that sufficient watering points (drinkers) are available.

Consideration should be given to the design and use of watering systems to ensure the provision of an adequate quantity of water of suitable quality. In addition, watering systems may carry a risk of flooding in the event of failure. It is strongly recommended that systems are designed to ensure that as few animals as possible are affected by any such failures. At least daily checks and regular cleaning are recommended to ensure blockages or leakages are detected and to reduce the spread of infection¹⁰. A diligent programme of maintenance and renewals is required.

Emergency provisions should be made in case pipes freeze or supplies otherwise fail¹¹.

4.9 Flooring, substrate, litter, bedding and nesting material

Various materials are commonly placed into the animal enclosure to serve the following functions: to absorb urine and faeces, and thus facilitate cleaning; to allow the animal to perform certain species-specific behaviour, such as foraging, digging or burrowing; to provide a comfortable, yielding surface or secure area for sleeping; to allow the animal to build a nest for breeding purposes.

Certain materials may not serve all of these needs, and it is therefore important to provide sufficient and appropriate materials. Any such materials should be dry, absorbent, dust-free, non-toxic and free from infectious agents or vermin and other forms of contamination. Materials derived from wood that have been chemically treated, or containing toxic natural substances, as well as products which cannot be clearly defined and standardised, should be avoided. Hydrocarbons present in wood-derived bedding have been shown to be capable of inducing cytochrome P450-dependent microsomal enzyme systems of animals resulting in altered drug metabolism.

In general, changes to the type of bedding material used should be avoided mid-study. Where changes are unavoidable, the investigators should be informed with as much notice as possible.

4.10 Cleaning

The standard of a facility, including good husbandry, depends very much on good hygiene. It is strongly recommended that a very high standard of cleanliness and order is also maintained in holding, washing and storage rooms. Adequate routines for the cleaning, washing, decontamination and, when necessary, sterilisation of enclosures and accessories, bottles and other equipment should be established and carried out.

¹⁰ Please see also the 'CoP' Standards applicable to all animals

¹¹ Please see also the 'CoP' Standards applicable to all animals

Consideration should be given to the design of these cleaning and disinfection regimes so as they are not detrimental to animal health or welfare. It is advisable that clear operating procedures, including a recording system, are in place for the changing of bedding in animal enclosures.

It is advisable that there should be regular cleaning and, where appropriate, renewal of the materials forming the ground surface in animal enclosures to avoid them becoming a source of infection and parasite infestation.

Odour-marking is an important form of behaviour in some species, and cleaning disturbances will cause some degree of social disruption. Cleaning regimes should have regard for these behavioural needs. Decisions on frequency of cleaning should be based on the type of animal enclosure, the type of animal, the stocking density, and the ability of the ventilation system to maintain suitable air quality.

4.11 Handling

The quality of care animals are given may influence not only breeding success, growth rate and welfare but also the quality and outcome of experimental procedures. Accustoming animals to competent and confident handling during routine husbandry and procedures reduces stress both to animals and personnel. For some species, for example dogs and non-human primates, a training programme to encourage co-operation during procedures can be beneficial to the animals, the animal care staff and the scientific programme. For certain species, social contact with humans should be a priority. However, in some cases, handling should be minimised (e.g. wild animals).

Staff caring for animals are expected at all times to have a caring and respectful attitude towards the animals in their care, and to be proficient in the handling and restraint of the animals. Where there is evidence of a welfare benefit for the animals concerned, staff time should be set aside for talking to, handling, training and grooming animals.

4.12 Humane killing

Personnel allowed to kill animals should be suitably trained. All humane methods of killing animals require expertise, which can only be attained by appropriate training. Section 9.5 of the Guidance on the Operation of the Animals (Scientific Procedures) Act 1986 sets out the training requirements for those killing animals. Animals should be killed using a method as set out in Section 6 of the same Guidance.

Careful consideration should be given to the minimisation of stress both for the animals to be killed and for those around them. Where practicable and appropriate, killing should take place away from the immediate presence of other animals. Animals to be killed should be handled carefully to ensure that fear and anxiety are minimised as much as possible.

Careful consideration should also be given to the health and well-being of staff charged with undertaking this activity.

4.13 Records

Records of source, use, retrospective severity of procedures and final disposal of all animals bred, kept for breeding, or for subsequent supply for use in scientific procedures should be used not only for statistical purposes but, in conjunction with health and breeding records, can also be used as indicators of animal welfare and for husbandry and planning purposes.

4.14 Identification

In some instances, it is necessary for animals to be individually identified, for example, when being used for breeding purposes or scientific procedures, to enable accurate records to be kept. The method chosen should be reliable and cause the minimum pain and discomfort to the animal when applied and in the long term. Sedatives or local anaesthetics and analgesics should be used if necessary. Staff should be trained in carrying out the identification and marking techniques. For more information see the Guidance on the Operation of the Animals (Scientific Procedures) Act 1986.

4.15 Specific requirements of breeding animals

Housing restricts an animal's ability to exercise choice and, therefore, has to provide for as many of their needs as can reasonably be met. The environmental needs of breeding animals are likely to differ from those of stock and experimental animals for four main reasons.

1. Breeding animals typically have longer lives than those used in experiments and the female is exposed to the stresses of reproduction. Hence, particular attention needs to be given to designing an environment that takes account of the animal's behavioural as well as physiological needs.
2. Animals give birth during the time of the day when they are usually quiescent and will often seek or create a secure place for parturition and the raising of offspring; typically a nest or den in the case of rodents, cats, dogs and birds. Such behaviour is strongly motivated. The breeder should ensure that the animal's need for privacy is considered. This can be achieved by the provision of nesting material, nest boxes or a secluded and sheltered area within the pen or cage. Nesting material also allows the animal to partially control its own environment (e.g. noise, temperature and humidity). Given the means for controlling its own microenvironment, the appropriate range of room temperatures may be wider than would otherwise be the case.
3. In some species when breeding stock are housed in social groups, subordinates and females that have just given birth may be vulnerable to social stresses. Extra care should be taken to prevent and monitor aggression and to separate individuals if necessary. Single housing for social species should only be considered on animal health or welfare grounds, unless it is permitted by Project Licence authority. Objects can act as barriers within the pen and allow animals greater control over their social interactions.
4. The needs of infants are different from those of adults. For example, they may have differing space and temperature requirements from adult animals. An adequately complex social and physical environment during development is needed to produce normal adults.



Chapter 2: Mice, rats, gerbils, hamsters and guinea pigs

This chapter must be read in conjunction with the *CoP, the Introduction and Chapter 1: Advice applicable to all animals*.

1 Advice applicable to all rodents

1.1 Environmental conditions

1.1.1 Ventilation

See Chapter 1: Advice applicable to all animals.

1.1.2 Temperature

Rodent rooms should be maintained within a temperature range appropriate for the species and strain, usually 20°C to 24°C for mice, rats, gerbils and hamsters and 15-21°C for guinea pigs. Biocontainment systems, for example IVCs or isolators, should be set to ensure that the temperature that the animal experiences is appropriate, usually within these ranges.

Local temperatures among groups of rodents in solid-floored enclosures will often be higher than room temperatures. Even with adequate ventilation the enclosure temperatures may be up to 6°C above room temperature, and this may represent the preferred nesting temperature for the animals as indicated by good breeding performance and absence of indicators of poor welfare. Nesting material/nest boxes give animals the opportunity to control their own microclimate.

Special attention should be paid to the temperatures provided for hairless animals.

1.1.3 Humidity

It is advisable that the relative humidity in rodent facilities should be kept at 45 to 65%. Excepted from this principle are gerbils, where it is advisable that the relative humidity be maintained between 35 and 55% (see part 4 below for further information).

1.1.4 Lighting

It is recommended that light levels within the enclosure are low. The light levels within cages are more important to the welfare of breeding rats, mice and hamsters than the light level in the room. All racks should ideally have shaded tops to reduce the risk of retinal degeneration. This is of particular importance for albino animals.

A period of red light at frequencies undetectable to the rodents can be useful during the dark period so that staff can monitor the rodents in their active phase. The importance of light to dark cycles in regulating circadian rhythms and stimulating and synchronising breeding cycles is well documented. A daily cycle of 12:12 is usual.

It is advisable that animals, especially when breeding, are given the opportunity to withdraw to shaded areas within the cage, for example by provision of adequate nesting materials.

1.1.5 Noise

As rodents are very sensitive to ultrasound, and use it for communication, it is important that this extraneous noise is minimised. Ultrasonic noise (over 20 kHz) produced by many common laboratory fittings, including dripping taps, trolley wheels and computer monitors, can cause abnormal behaviour and breeding cycles. It is advisable to check the acoustic environment over a broad range of frequencies and over extended time periods. Sudden irregular noises create more disturbance in breeding rodents than continuous or predictable sounds. The rodent neonate uses ultrasound production to communicate distress – it is important that extraneous noise is minimised during late pregnancy and early lactation to reduce the risk of mismothering or cannibalism.



1.1.6 Alarm systems

See Chapter 1: Advice applicable to all animals.

1.2 Health

See Chapter 1: Advice applicable to all animals.

1.3 Housing, enrichment and care

1.3.1 Housing

Gregarious species should be group housed as long as the groups are stable and harmonious – social housing is vitally important to the welfare of social species and strains. When housing certain types of animals, for example males of some strains of mice and adult hamsters of some species, it can be difficult to achieve harmonious groups due to the risk of aggression, which can be severe. Expert advice should be sought as such groupings can be successful if done correctly. Animals may be housed individually if adverse effects or injury are likely to occur¹². It is advisable to minimise disruption of established stable and harmonious groups, as this can be very stressful to the animals.

Incompatible species (for example, predator-prey species) may not be housed together¹³. Rats are opportunistic predators of mice. Evidence is equivocal as to whether housing mice and rats in open top cages in the same room is stressful to either/both species. On a precautionary basis, it is advisable to avoid such an arrangement in order to reduce the potential for scientific variability, and in the interests of minimising avoidable potential stressors. Should housing mice and rats in open top cages in the same room appear unavoidable, you should evaluate the likely impact on your proposed use of the mice and discuss this with your local Inspector. There is no evidence to suggest that housing mice and rats in IVCs in the same room is detrimental, provided they are kept in separate racks and the air flow into/out of the racks is set up appropriately.

1.3.2 Enrichment

The enclosures and their enrichment should allow the animals to reduce competitive situations adequately¹⁴. Bedding and nesting material and refuges are very important resources for rodents and should normally be provided. Cage enrichment and social interaction are considered to be of more value to the animal than simple floor space allocation. Large featureless cages can induce anxiety in rats.

Nesting materials should allow the rodents to manipulate the material and construct a nest. Nest boxes should normally be provided, especially if insufficient nesting material is provided for the animals to build a complete, covered nest¹⁵. Where sufficient nesting material is withheld there should be sound scientific justification. Bedding materials should ideally absorb urine and may be used by the rodents to lay down urine marks. Nesting material is important for rats, mice, hamsters and gerbils as it enables them to create appropriate microenvironments for resting and breeding. Nest boxes or other refuges are important for guinea pigs, hamsters, rats and many strains of mice, although they may increase aggression in some strains of group-housed male mice. Nest-box design is important to reduce aggression and the risk of injury, for example boxes with two entry/exit holes can help to diffuse antagonistic encounters because they cannot be blocked by a dominant animal. Wood sticks for chewing and gnawing may be considered for enrichment for all rodent species, provided the material chosen will not confound the science¹⁶.

Many rodent species attempt to divide up their own enclosures into areas for feeding, resting, urination and food storage. These divisions may be based on odour marks rather than physical division but partial barriers may be beneficial to allow the animals to initiate or avoid contact with other group members. To increase environmental complexity the addition of some form of enclosure enrichment is

¹² See the 'CoP' Introduction: Specifying deviations from CoP standards

¹³ In order to meet the requirements of the 'CoP' Chapter 1 Standards applicable to all animals

¹⁴ In order to meet the requirements of the 'CoP' Chapter 1 Standards applicable to all animals

¹⁵ In order to meet the requirements of the 'CoP' Chapter 1 Standards applicable to all animals

¹⁶ See Chapter 1 Advice applicable to all animals



strongly recommended. Tubes, boxes and climbing racks are examples of devices which have been used successfully for rodents, and these can have the added benefit of increasing utilisable floor area.

Consideration should be given to the use of translucent or tinted enclosures and inserts which permit good observation of the animals without disturbing them.

The same principles regarding quality and quantity of space, environmental enrichment and other considerations in this document should apply to containment systems such as Individually Ventilated Cages (IVCs), although the design of the system may mean that these may have to be approached differently.

1.3.3 Dimensions and flooring

Once young animals become active they require proportionally more space than adults. Animals' requirements to stretch to their full length should be taken into account when designing housing.

Solid floors with bedding or perforated floors are preferable to grid or wire mesh floors, and sound scientific justification is required to house rodents on grids or wire mesh. If grids or wire mesh are used, a solid or bedded area or, as an alternative in the case of guinea pigs, a slatted area, should be provided for the animals to rest on unless specific experimental conditions prevent this, and are authorised by the Project Licence¹⁷. Bedding may be withheld as part of time-mating practices.

As mesh floors can lead to serious injuries, if they must be used the floors should be closely inspected and maintained to ensure that there are no loose or sharp projections.

Rats, mice and hamsters are normally bred on solid floors and require suitable bedding material (e.g. shredded paper or wood chippings) from which a nest can be constructed. This is important in thermoregulation of the microenvironment and keeps the young together for efficient lactation.

1.3.4 Feeding

See Chapter 1: Advice applicable to all animals.

1.3.5 Watering

See Chapter 1: Advice applicable to all animals.

1.3.6 Substrate, litter, bedding and nesting material

See Chapter 1: Advice applicable to all animals.

1.3.7 Cleaning

Although high hygiene standards should be maintained, it may be advisable to maintain some odour cues left by animals. Too frequent changing of enclosures should be avoided, particularly where pregnant animals and females with litters are concerned, as such disturbances can result in mismothering or cannibalism. There is some evidence that transferring nesting material, but not soiled bedding, can be useful in order to maintain odour cues.

Decisions on frequency of cleaning should therefore be based on the type of enclosure, type of animal, stocking densities, and the ability of ventilation systems to maintain suitable air quality.

1.3.8 Handling

When handling, care needs to be taken to minimise disturbance of the animals or their enclosure environment. This is of particular importance with hamsters.

1.3.9 Humane killing

See Chapter 1: Advice applicable to all animals.

¹⁷ Failure to provide such a resting area without authorisation is likely to breach the requirements of the 'CoP' *Standards applicable to all animals*



1.3.10 Records

See Chapter 1: Advice applicable to all animals.

1.3.11 Identification

See Chapter 1: Advice applicable to all animals.

2 Additional advice applicable to mice

The mouse used for research purposes is a subspecies hybrid of a number of fancy breeds, and has developed into a range of well-defined inbred, outbred and genetically modified strains through intensive breeding over a period of more than 100 years.

2.1 Environmental conditions

2.1.1 Ventilation

See Part 1: Advice applicable to all rodents.

2.1.2 Temperature

See Part 1: Advice applicable to all rodents.

2.1.3 Humidity

See Part 1: Advice applicable to all rodents.

2.1.4 Lighting

See Part 1: Advice applicable to all rodents.

2.1.5 Noise

Mice have very acute hearing and are sensitive to ultrasound.

2.1.6 Alarm systems

See Part 1: Advice applicable to all rodents.

2.2 Health

See Part 1: Advice applicable to all rodents.

2.3 Housing, enrichment and care

2.3.1 Housing

A wide range of social organisations have been observed depending on population density and intense territoriality may be seen in reproductively active males. Pregnant and lactating females may prove aggressive in nest defence. There are considerable differences in the expression and intensity of behaviour depending on the strain.

2.3.2 Enrichment

See Part 1: Advice applicable to all rodents.

2.3.3 Dimensions and flooring

See Part 1: Advice applicable to all rodents.



2.3.4 Feeding

See Part 1: Advice applicable to all rodents.

2.3.5 Watering

See Part 1: Advice applicable to all rodents.

2.3.6 Substrate, litter, bedding and nesting material

See Part 1: Advice applicable to all rodents.

2.3.7 Cleaning

As mice, particularly albino strains, have poor sight they rely heavily on their sense of smell and create patterns of urine markings in their environment.

2.3.8 Handling

See Part 1: Advice applicable to all rodents.

2.3.9 Humane killing

See Part 1: Advice applicable to all rodents.

2.3.10 Records

See Part 1: Advice applicable to all rodents.

2.3.11 Identification

See Part 1: Advice applicable to all rodents.

3 Additional advice applicable to rats

3.1 Environmental conditions

3.1.1 Ventilation

See Part 1: Advice applicable to all rodents.

3.1.2 Temperature

See Part 1: Advice applicable to all rodents.

3.1.3 Humidity

See Part 1: Advice applicable to all rodents.

3.1.4 Lighting

Daylight vision is poor, but dim-light vision is effective in some pigmented strains. Albino rats avoid areas with light levels over 25 lux.

3.1.5 Noise

Rats are particularly sensitive to ultrasound.

3.1.6 Alarm systems

See Part 1: Advice applicable to all rodents.



3.2 Health

See Part 1: Advice applicable to all rodents.

3.3 Housing, enrichment and care

3.3.1 Housing

See Part 1: Advice applicable to all rodents.

3.3.2 Enrichment

See Part 1: Advice applicable to all rodents.

3.3.3 Dimensions and flooring

For rat housing which includes a shelf area with 18 cm or more vertical space (clearance between the shelf and the floor and the shelf and roof), the shelf may count towards the total floor area.

3.3.4 Feeding

See Part 1: Advice applicable to all rodents.

3.3.5 Watering

See Part 1: Advice applicable to all rodents.

3.3.6 Substrate, litter, bedding and nesting material

See Part 1: Advice applicable to all rodents.

3.3.7 Cleaning

See Part 1: Advice applicable to all rodents.

3.3.8 Handling

See Part 1: Advice applicable to all rodents.

3.3.9 Humane killing

See Part 1: Advice applicable to all rodents.

3.3.10 Records

See Part 1: Advice applicable to all rodents.

3.3.11 Identification

See Part 1: Advice applicable to all rodents.

4 Additional advice applicable to gerbils

4.1 Environmental conditions

4.1.1 Ventilation

See Part 1: Advice applicable to all rodents.

4.1.2 Temperature

See Part 1: Advice applicable to all rodents.



4.1.3 Humidity

Gerbils are susceptible to high relative humidity, which can predispose them to skin conditions such as facial dermatitis and greasy coats. Humidity levels of below 50% should prevent these problems. In animal units in which humidity levels are maintained at $55 \pm 15\%$, lower humidity within the gerbil cages can be promoted by adequate provision of dry, absorbent bedding material.

4.1.4 Lighting

Light levels within cages are more important to the welfare of breeding gerbils than the light level in the room. There is evidence that gerbils exhibit a preference for partially darkened cages, and for this reason consideration should be given to providing shelter objects or suitable material from which a shelter/nest can be constructed. Light intensity should ideally be no greater than that which is required by husbandry practices or for safety reasons.

4.1.5 Noise

Sudden irregular noises create more disturbance in breeding gerbils than continuous or predictable sounds, and can induce epileptiform seizures in susceptible animals.

4.1.6 Alarm systems

See Part 1: Advice applicable to all rodents.

4.2 Health

See Part 1: Advice applicable to all rodents.

4.3 Housing, enrichment and care

4.3.1 Housing

The use of opaque breeding cages should be considered to reduce aggressive behaviour and prevent reduced breeding performance. As significant fighting and even deaths can occur during the establishment of breeding pairs, careful selection and monitoring is necessary, with consideration given to pairing in a “neutral” environment.

Nest-box configuration has been shown to be important in reducing stereotypical digging behaviour – it should ideally have a separation wall and a tunnel entrance including a bend/corner.

4.3.2 Enrichment

In the wild, gerbils build burrows with tunnel entrances as a protection against predators, and therefore in captivity often develop stereotypic digging behaviour unless provided with adequate facilities and enrichment.

Gerbils require a deep layer of litter for digging and nesting and a burrow substitute. A burrow substitute should ideally be at least 20cm long.

4.3.3 Dimensions and flooring

Gerbils need comparatively more space than other rodent species in order to allow them to build and/or use burrows of sufficient size.

4.3.4 Feeding

See Part 1: Advice applicable to all rodents.

4.3.5 Watering

See Part 1: Advice applicable to all rodents.



4.3.6 Substrate, litter, bedding and nesting material

As not all litter is suitable for digging (e.g. sawdust-type litter), litter of a kind that is suitable for digging proper burrows should be provided wherever possible.

4.3.7 Cleaning

See Part 1: Advice applicable to all rodents.

4.3.8 Handling

Gerbils require confident, competent and careful handling, as this species has some unusual responses if mishandled. Poor handling may induce a “freeze” response, during which the animal becomes immobile, or may induce epileptiform convulsions. As epilepsy is a familial trait in gerbils, this factor should be considered during selection of replacement breeding stock. Lifting the animal by the tail should be avoided, as this may result in the separation of the skin of the distal tail, known commonly as degloving.

4.3.9 Humane killing

See Part 1: Advice applicable to all rodents.

4.3.10 Records

See Part 1: Advice applicable to all rodents.

4.3.11 Identification

See Part 1: Advice applicable to all rodents.

5 Additional advice applicable to hamsters

It is recognised that different species of hamster have different care and accommodation needs. Due consideration should be given to species-specific needs when defining or reviewing care and accommodation practices. The minimum cage sizes for hamsters specified in *Section 1 Chapter 2 Mice, rats, gerbils, hamsters and guinea pigs* apply to all hamster species.

5.1 Environmental conditions

5.1.1 Ventilation

See Part 1: Advice applicable to all rodents.

5.1.2 Temperature

See Part 1: Advice applicable to all rodents.

5.1.3 Humidity

See Part 1: Advice applicable to all rodents.

5.1.4 Lighting

See Part 1: Advice applicable to all rodents.

5.1.5 Noise

See Part 1: Advice applicable to all rodents.

5.1.6 Alarm systems

See Part 1: Advice applicable to all rodents.



5.2 Health

See Part 1: Advice applicable to all rodents.

5.3 Housing, enrichment and care

5.3.1 Housing

Hamsters often make a latrine area within the enclosure, mark areas with secretions from a flank gland, and females frequently selectively reduce the size of their own litter by cannibalism.

5.3.2 Enrichment

See Part 1: Advice applicable to all rodents.

5.3.3 Dimensions and flooring

The climbing behaviour of hamsters should be taken into account when designing cages.

5.3.4 Feeding

Hamsters require food hoppers with wide slots as they have wide snouts.

5.3.5 Watering

See Part 1: Advice applicable to all rodents.

5.3.6 Substrate, litter, bedding and nesting material

See Part 1: Advice applicable to all rodents.

5.3.7 Cleaning

See Part 1: Advice applicable to all rodents.

5.3.8 Handling

See Part 1: Advice applicable to all rodents.

5.3.9 Humane killing

See Part 1: Advice applicable to all rodents.

5.3.10 Records

See Part 1: Advice applicable to all rodents.

5.3.11 Identification

See Part 1: Advice applicable to all rodents.

6 Additional advice applicable to guinea pigs

6.1 Environmental conditions

6.1.1 Ventilation

See Part 1: Advice applicable to all rodents.

6.1.2 Temperature

See Part 1: Advice applicable to all rodents.



6.1.3 Humidity

See Part 1: Advice applicable to all rodents.

6.1.4 Lighting

See Part 1: Advice applicable to all rodents.

6.1.5 Noise

Guinea pigs tend to freeze at unexpected sounds and may stampede, with a risk of injury, in response to sudden unexpected movements or noise. Care should be taken to minimise the generation of sudden extraneous audible and ultrasound noise in the vicinity of the animals.

6.1.6 Alarm systems

See Part 1: Advice applicable to all rodents.

6.2 Health

See Part 1: Advice applicable to all rodents.

6.3 Housing, enrichment and care

6.3.1 Housing

Adult male guinea pigs may be aggressive to each other, but generally aggression is rare. Guinea pigs do well in floor pens provided care is taken to avoid draughts and plenty of bedding material is supplied.

6.3.2 Enrichment

See Part 1: Advice applicable to all rodents.

6.3.3 Dimensions and flooring

See Part 1: Advice applicable to all rodents.

6.3.4 Feeding

Guinea pigs are unable to synthesise vitamin C (ascorbic acid) in sufficient quantity to meet their daily requirements. It is therefore essential that their diet is of suitable composition to meet this requirement.

6.3.5 Watering

See Part 1: Advice applicable to all rodents.

6.3.6 Substrate, litter, bedding and nesting material

It is strongly recommended that guinea pigs are always provided with materials they can manipulate, such as hay for chewing and concealment.

6.3.7 Cleaning

See Part 1: Advice applicable to all rodents.

6.3.8 Handling

Guinea pigs are extremely sensitive to being moved and may freeze as a result for 30 minutes or more.

6.3.9 Humane killing

See Part 1: Advice applicable to all rodents.



6.3.10 Records

See Part 1: Advice applicable to all rodents.

6.3.11 Identification

See Part 1: Advice applicable to all rodents.



Chapter 3: Rabbits

This chapter must be read in conjunction with *the CoP, the Introduction and Chapter 1: Advice applicable to all animals*.

1 Environmental conditions

1.1 Ventilation

To maintain suitable air quality, air flow rates required may differ depending on the type of accommodation, with tiered racks of cages likely to require higher rates than single-tiered open mesh cages and floor pens. As rabbits shed considerable amounts of hair, consideration should be given to cleaning the extract ducts regularly to ensure continued efficiency of ventilation.

1.2 Temperature

It is recommended that rabbit rooms are maintained in a temperature range of 15°C to 21°C. It is recommended that temperature regulation ensures that there are no undue fluctuations which could cause unnecessary stress and clinical welfare problems. Local temperatures among groups of rabbits in solid-floored enclosures will often be higher than room temperatures. Even with adequate ventilation the enclosure temperatures may be up to 6°C above room temperature and careful observation will be required to ascertain whether this represents the rabbits' preferred temperature or whether there is any evidence of a negative welfare impact. Nesting material/nest boxes give animals the opportunity to control their own microclimate.

1.3 Humidity

It is recommended that the relative humidity in rabbit facilities is not less than 45%. It is recommended that fluctuations in humidity are avoided as these can precipitate respiratory disease.

1.4 Lighting

See Chapter 1: Advice applicable to all animals.

1.5 Noise

Rabbits are easily frightened by sudden unexpected loud noise and may injure themselves in panic. Some forms of low-level background noise in the animal room may be beneficial in reducing the impact of sudden loud noises. As rabbits are sensitive to ultrasound, care should be taken to minimise the generation of extraneous audible and ultrasound noise in the vicinity of the animals.

1.6 Alarm systems

See Chapter 1: Advice applicable to all animals.

2 Health

See Chapter 1: Advice applicable to all animals.

3 Housing, enrichment and care

3.1 Housing

Rabbits should be allowed adequate space and an enriched environment – the denial of which can result in loss of normal locomotor activity and in skeletal abnormalities¹⁸.

The rabbit is a naturally gregarious species and attention should be paid to their social well-being. Young and female rabbits should normally be housed in harmonious social groups. Single housing

¹⁸ In order to meet the requirements of the 'CoP' Chapter 1: *Standards applicable to all animals*,



should only occur on animal health or welfare grounds, unless it is permitted by Project Licence authority¹⁹. Adult entire males may perform territorial behaviour and are not normally housed with other entire males. Pregnant females may require temporary single housing in order to avoid aggression and safeguard their welfare. Enriched floor pens have been used with success to house young rabbits and adult female rabbits although groups may need to be carefully managed to avoid aggression.

Ideally rabbits for group housing should be littermates that have been kept together since weaning. Where individuals cannot be group housed, consideration should be given to housing them in close visual contact.

3.2 Enrichment

Suitable enrichment for rabbits includes roughage, hay blocks or chew sticks as well as an area for withdrawal. In floor pens for group housing, visual barriers and structures to provide refuges and lookout behaviour should normally be provided. For breeding does nesting material and a nest box are appropriate provisions.

3.3 Dimensions and flooring

The CoP requires that a raised area is provided within the enclosure. This is to encourage normal locomotor activity and can also be used as a lookout point.

Wherever it is possible, rabbits should be kept in floor pens. Where rabbits are to be held in floor pens, attention should be given to the avoidance of draughts. Floor pens should be constructed with consideration of minimising damage to feet and hocks. It is recommended that pens contain structures that subdivide the space to allow animals to initiate or avoid social contact.

Wire floors should not be used without the provision of a resting area large enough to hold all the rabbits at any one time, as this may cause injury to the animals. Solid floors with bedding or perforated floors are preferable to grid or wire mesh floors.

3.4 Feeding

Feeding rabbits in the afternoon corresponds better with their natural foraging period, and has been shown to reduce abnormal activity such as bar biting during the dark (active) phase. There is a need for a high level of dietary roughage (e.g. hay), to maintain gastrointestinal health, but also to help prevent boredom.

3.5 Watering

See Chapter 1: Advice applicable to all animals.

3.6 Substrate, litter, bedding and nesting material

See Chapter 1: Advice applicable to all animals.

3.7 Cleaning

See Chapter 1: Advice applicable to all animals.

3.8 Handling

Domestic rabbits were not selected to be tractable towards humans and so they retain a behavioural repertoire that is similar to their wild type ancestors. They are largely nocturnal, have a wide field of vision and are easily frightened. It is therefore important to minimise stress. Regular handling from an early age can help with this, for example from ten days of age.

3.9 Humane killing

See Chapter 1: Advice applicable to all animals.

¹⁹ See the 'CoP' Introduction: *Specifying deviations from CoP standards*.



3.10 Records

See Chapter 1: Advice applicable to all animals.

3.11 Identification

See Chapter 1: Advice applicable to all animals.

3.12 Considerations for breeding rabbits

A minimum of three to four days before giving birth, it is recommended that does are provided with an extra compartment or a nest box in which they can build a nest. The nest box should preferably be outside the enclosure. Hay, straw or other nesting material should be provided²⁰. It is recommended that the enclosure is designed so that the doe can move to another compartment or raised area away from her kits after they have left the nest. The young rabbits emerge from the nest box at two to three weeks of age and are generally weaned at four to six weeks. After weaning, the littermates should ideally stay together in their breeding enclosure as long as possible.

²⁰ In order to meet the requirements of the 'CoP' Chapter 1: *Standards applicable to all animals*



Chapter 4: Cats

This chapter must be read in conjunction with *the CoP, the Introduction and Chapter 1: Advice applicable to all animals*.

1 Environmental conditions

1.1 Ventilation

See Chapter 1: Advice applicable to all animals.

1.2 Temperature

Cats may be maintained within a wide temperature range provided that their welfare is not compromised. A temperature range between 15°C and 21°C is suitable when precise control is required for cats under procedure (as determined by the investigator and justified as necessary). As kittens have limited thermoregulatory control for around the first ten days of life, it is recommended to provide additional local heating during this period. Where experimental protocols allow, a “basking area” provided by a heat lamp or radiator would provide environmental enrichment and allow animals some control over their environmental temperature.

1.3 Humidity

It is considered unnecessary to control relative humidity, as cats can be exposed to wide fluctuations of ambient relative humidity without adverse effects. However, recording humidity on a regular basis can be considered good practice in early identification of developing issues.

1.4 Lighting

Holding of cats under the natural 24-hour light-dark cycle is acceptable. Where the light part of the photoperiod is provided by artificial lighting, it is recommended that this is within a range of 10 to 12 hours daily.

If natural light is totally excluded, it is recommended that low-level night lighting (5 to 10 lux) is provided to allow cats to retain some vision and to take account of their startle reflex. Some light systems have been shown to be aversive to some animals, possibly because they may perceive light sources as flickering whereas humans do not. The photoperiod may be varied in cat colonies as a method of controlling the reproductive cycle.

1.5 Noise

The hearing range of cats is 0.07–91 kHz, with peak sensitivity 1–40 kHz. Unpredictable noises cause stress. Sound-absorbing materials or the use of background sound (such as radio music when played quietly) will help reduce the disturbance caused by husbandry-generated noise or other sudden, unexpected noises.

1.6 Alarm systems

See Chapter 1: Advice applicable to all animals.

2 Health

See Chapter 1: Advice applicable to all animals.



3 Housing, enrichment and care

3.1 Housing

As cats are territorial and become attached to particular locations they are likely to be stressed by relocation. Cats are excellent climbers and utilise raised structures (e.g. shelves) extensively, both as vantage points and, when housed in groups, to maintain a distance from other cats.

Female cats and neutered cats of both sexes are generally sociable and are commonly held in groups of up to 12 – wherever practicable cats should be housed in social groups. However, the establishment of groups of two or more cats requires careful monitoring for the compatibility of all the individuals in the group. Special care is needed when regrouping cats, introducing an unfamiliar cat to a group, housing un-neutered males in a group or maintaining cats in larger groups.

If a behaviour or welfare issue is detected or a risk, it is recommended that a system for monitoring social stress is initiated using an established behavioural and/or physiological stress scoring system. This is especially important for un-neutered males.

Where cats are normally group housed, single housing may be a significant stress factor. Where they must be housed singly – on animal health or welfare grounds, or where permitted by Project Licence authority – it is strongly recommended that they should be let out for exercise at least once a day where this does not interfere with procedures²¹.

Females with kittens under four weeks of age or in the last two weeks of pregnancy may be housed singly. During this time, consideration should also be given to allowing females which are normally group housed to have access to their group e.g. by connecting kitting enclosures to the group housing animal enclosures.

It is advisable that enclosures, including the divisions between enclosures, provide a robust and easy-to-clean environment for the cats. It is advisable that their design and construction seek to provide an open and light facility giving the cats comprehensive sight outside of their enclosure. The design of enclosures should ideally also provide an enclosed area out of view of other cats, while at the same time allowing for easy inspection of animals by staff.

It is strongly recommended that cats should never be forced to spend their entire lives outside and should always have access to an internal enclosure that meets all required standards. Outside runs do, however, provide an environmental enrichment opportunity for cats in both breeding and user establishments and should be provided where possible.

3.2 Enrichment

It is advisable that vertical wooden surfaces are provided to allow claw-sharpening and scent-marking. Raised, part-enclosed structures are recommended (e.g. a bed with three walls and a roof on a shelf approximately one metre off the floor) to give the cats a view of their surroundings and, if pair or group housed, the opportunity to maintain a comfortable distance from other cats. There should be a sufficient number of these structures to minimise competition. Structures should be distributed within the enclosure so that animals can fully use the three-dimensional space available.

Where females with kittens are confined within a cage environment, additional exercise is advisable for the queen on a daily basis with access to human social contact and ancillary play equipment. A usable shelf or solid nest box lid is recommended to permit the queen some personal space distant from the litter.

It is recommended that pseudo-predatory and play behaviour are encouraged. A selection of toys should ideally be available and these should be changed on a regular basis in order to ensure ongoing stimulation and avoid familiarity, which decreases the motivation to play. It is recommended that all cats have a period of play and general social interactions with humans on a daily basis, plus additional time for regular grooming. Particular attention should be paid to social enrichment for single-housed cats by providing additional human contact wherever practicable.

²¹ See the 'CoP', Introduction: *Specifying deviations from CoP standards*.



3.3 Dimensions and flooring

The preferred flooring for cat enclosures is a solid continuous floor with a smooth non-slip finish. The provision of additional enclosure furniture will provide all cats with a comfortable resting place.

Open flooring systems such as grids or mesh should not be used for cats as they may cause injury to the animals²². Where there is compelling scientific justification and Project Licence authority for open flooring, great care should be taken in their design and construction in order to avoid pain, injury or disease and to allow the animals to manifest normal behaviours. Practical experience shows that metabolism cages are not always necessary as cats' urine and faeces can be collected directly from litter trays.

The quality and finish of the floor of an outside run need not be to the standard of the inside enclosure, providing it is easy to clean and not physically injurious to the cats.

Constraint in a space below the minimum requirement, such as in a metabolism cage, or any similar type of housing for scientific purposes, may severely compromise the welfare of the animals. Such constraint should be for the minimum time and within a space that is as close as possible to the minimum and no less than that required for the animal to stretch fully horizontally and vertically, to lie down and turn around.

Due consideration should be given to ensuring there is adequate separation between feeding, resting and litter tray areas.

3.4 Feeding

See Chapter 1: Advice applicable to all animals.

3.5 Watering

See Chapter 1: Advice applicable to all animals.

3.6 Substrate, litter, bedding and nesting material

An appropriate number and size of litter trays should be provided for the number of cats in the enclosure and should contain a suitable depth of absorbent and non-toxic litter or substrate material that is acceptable to and used by the cats. If urine and faeces are regularly deposited outside the trays, additional trays containing alternative substrates may be required. The frequency of litter changing may also need to be increased. If this is ineffective in pair- or group-housed cats, social incompatibility may be the cause, and it is recommended that cats are removed from the group one at a time until the problem is resolved.

It is advisable that sufficient beds are provided for all cats and should be made of a suitable easy-to-clean material. Bedding materials such as polyester fleece or similar are recommended. Cats require sleeping areas that are quiet and warm and if kept in groups, cats should have the choice to sleep on their own. Cats also, when allowed to exhibit natural instincts, will often sleep at a height, so sleeping boxes may be hung on walls or at different heights especially in the corners of rooms where they cannot be approached from behind.

3.7 Cleaning

It is advisable that each occupied enclosure is cleaned at least daily. It is recommended that litter trays are emptied daily and litter material replaced. Cleaning of enclosures should not result in cats becoming wet. When enclosures are hosed down, it is advisable to remove the cats from the enclosure to a dry place and return them only when the enclosure is reasonably dry.

3.8 Handling

The domestic cat has a strong tendency to learn social behaviour. With appropriate socialisation provided at an early age, such behaviour can be expressed both to conspecifics and man.

²² 'CoP' Chapter 1: *Standards applicable to all animals*



Good social interaction with humans encourages suitable temperament for subsequent studies. However, forming social relationships may be stressful. Visible signs that cats are stressed are not as straightforward to interpret as those in dogs.

In setting staff levels it is most important to take into account time for the important human social interactions required, especially for kittens and any single-housed animals.

For cats, close contact with the persons caring for them is crucial. Particular attention should be paid to single-housed cats by providing additional human contact.

The development of social behaviour in cats is profoundly affected by social experience between two and eight weeks of age. During this period it is particularly important that the cat has social contacts with other cats (e.g. littermates) and with humans and is familiarised with environmental conditions likely to be encountered during subsequent use. Daily handling during this sensitive stage of development is a prerequisite for the social behaviour of the adult cat and it has been shown that a short period of handling even on the first day after birth is of importance as the young animals are already able to respond to scent and tactile stimulation. The normal age for weaning is seven to nine weeks. Where possible socialisation should continue until kittens reach 14 weeks of age.

3.9 Humane killing

See Chapter 1: Advice applicable to all animals.

3.10 Records

See Chapter 1: Advice applicable to all animals.

3.11 Identification

All cats in a facility should be identified with a permanent and unique identification code before weaning. Individual animals can be identified visually by using properly fitted collars with attached medallions or tattoos. Tattoos are the least preferred method. Animals should be sedated for the purposes of tattooing and local or topical anaesthesia should be used; this will reduce stress in the animals and reduce the risk of injury to the handler. For some individuals general anaesthesia may be necessary – this should be judged on a case-by-case basis. Alternatively, the animal may be tattooed when anaesthetised for other purposes. Analgesia may be given before or after tattooing.

Microchips can be injected into accessible sites (usually the scruff of the neck). As it is important to be able easily to distinguish animals, some laboratories successfully use names for the animals. Ear notching or other mutilations are not considered appropriate methods.

The method of identification should be chosen with due consideration for the intended scientific use of the animal.



Chapter 5: Dogs

This chapter must be read in conjunction with *the CoP, the Introduction and Chapter 1: Advice applicable to all animals*.

1 Environmental conditions

1.1 Ventilation

See Chapter 1: Advice applicable to all animals.

1.2 Temperature

Dogs may be maintained within a wide temperature range provided that their welfare is not compromised. It is advisable to prepare suitable contingency plans to deal with extremes of temperature, seen occasionally in hot summers or cold winters, to ensure that a comfortable environment is maintained for the animals. A temperature range of approximately 15°C to 24°C (as determined by the investigator and justified as necessary) is appropriate when precise control is required for dogs under procedure. It is advisable to ensure that outdoor pens provide shelter against adverse weather conditions.

As puppies have limited thermoregulatory control in the first ten days or so of life, it is advisable to provide additional local heating within the whelping enclosure. New-born puppies require a local environmental temperature of 26–28°C for at least the first five to ten days of life.

1.3 Humidity

It is considered unnecessary to control relative humidity, as dogs can be exposed to wide fluctuations of ambient relative humidity without adverse effects.

1.4 Lighting

The holding of dogs under the natural 24-hour light-dark cycle is acceptable. Where the light part of the photoperiod is provided by artificial lighting, it is advisable for this to be within a range of 10 to 12 hours daily.

If natural light is totally excluded, the provision of low-level night lighting (5 to 10 lux) is recommended to allow dogs to retain some vision and to take account of their startle reflex.

1.5 Noise

Noise in dog kennels can reach high levels which are known to cause damage to humans, and which could affect dogs' health or physiology. For these reasons it is important to consider methods of reducing noise in dog facilities. By addressing the dogs' behavioural needs in the facility design, the level of vocalisation may be decreased. For example, socialisation and habituation of dogs to the presence of humans will reduce barking behaviour. Much of the noise is generated by the dogs' own vocalisations, but may also be generated by husbandry operations within the facility and ingress from outside sources. Consideration should therefore be given to limiting as far as possible any source of noise that may stimulate further dog barking. Penetration of external noise can be reduced by appropriate siting of the facility and by appropriate architectural design. Noise generated within the facility can be reduced by noise absorbent materials or structures. It is advisable to seek expert advice on noise reduction when designing or modifying dog accommodation.

1.6 Alarm systems

See Chapter 1: Advice applicable to all animals.

2 Health

See Chapter 1: Advice applicable to all animals.



3 Housing, enrichment and care

It is recommended that the number of staff is adequate to maintain the size of breeding colonies and good standards of husbandry and care. In setting staff levels it is most important to take into account the additional time for the essential human interactions required, especially with pups and single-housed animals.

3.1 Housing

The domestic dog is an inquisitive and highly social animal which actively seeks information about its surroundings. Although much of the day is spent resting, the dog requires a complex physical and social environment during the active phase.

As aggression is a significant risk, care is needed to maintain dogs in socially harmonious groups. The recommendations provided are for the beagle, the most commonly used breed. Account should be taken of individual breed characteristics if other breeds are used.

Dogs should be housed in socially harmonious groups within the animal enclosure, unless the scientific procedures or welfare requirements make this impossible. Special care is needed when regrouping dogs or introducing an unfamiliar dog to a group. In all cases, it is advisable to monitor groups for social compatibility on an ongoing basis.

Single housing of dogs for even short periods can be a significant stress factor. Where they must be housed singly – on animal health or welfare grounds, or where permitted by Project Licence authority²³ – additional human socialisation time, and visual, auditory and, where possible, tactile contact with other dogs is recommended on a daily basis. Unless contra-indicated on scientific grounds, single-housed dogs should be allowed to exercise in a separate area with other dogs if possible, and with staff supervision and interaction, on a daily basis. Long-term single housing and social isolation are closely associated with a range of behavioural disturbances and it is therefore advisable that it should only be used as an option of last resort for an aggressive dog, or in the case of the periparturient bitch.

Stud dogs should, wherever possible, be housed in socially harmonious pairs or groups or with bitches.

Bitches seek solitude in a quiet area for parturition and rearing of young. It is recommended that periparturient bitches are moved to the whelping enclosure approximately one to two weeks prior to expected parturition. It is recommended that while in the whelping enclosure they have additional daily human contact.

Consideration should be given to the provision of veterinary hospitalisation and isolation facilities. Where such facilities are below the space requirements outlined in the CoP or limit social contact with other dogs, the amount of time spent in them by dogs needing treatment should be restricted to the minimum necessary and used only as directed by a veterinary surgeon.

It is advisable that enclosures, including the divisions between enclosures, provide a robust and easy-to-clean environment for the dogs. Consideration should be given to ensuring that their design and construction provides an open and light facility, giving the dogs comprehensive sight of other dogs and staff outside of their immediate animal enclosure.

It is strongly recommended that dogs should never be forced to spend their entire lives outside and should at all times have access to an internal enclosure that meets all required standards.

3.2 Enrichment

Outside runs provide an environmental enrichment opportunity for dogs. The design of indoor and outdoor enclosures should ideally allow some privacy for the dogs and enable them to exercise some control over their social interactions.

It is advisable to provide separate areas for different activities. This can be achieved by, for example, inclusion of raised platforms and pen subdivisions. Subdivision of dog pens into separate sleeping and

²³ See the 'CoP' Introduction: *Specifying deviations from CoP standards*.



exercise areas is recommended. This provides some environmental complexity and allows the animal to defecate/urinate away from its sleeping area. Provision of platforms within pens offers several benefits – provided that they have sufficient height so as not to limit the floor area below – including increasing the complexity of pens, providing a viewpoint and sleeping/resting area for dogs on top of the platform and providing a retreat or sleeping area under the platform.

Dog treats and toys afford welfare benefits to the animals, providing these are used sensibly and adequately monitored. As chewing is an important behaviour, providing items which meet this need is strongly recommended.

The primary advantages of exercise are to allow additional opportunities for dogs to experience a complex and varied environment and to increase interaction with other dogs and humans. These will be particularly important where these needs cannot be fully met within the space provided by the animal enclosure. Therefore, unless contra-indicated on scientific or veterinary grounds, dogs should normally be removed to a separate area and allowed to exercise, with other dogs where possible, and with staff supervision and interaction, ideally on a daily basis.

3.3 Dimensions and flooring

It is advisable for pens to have sufficient depth to allow nervous dogs to retreat from the front of the pen.

Any further social or physical constraint, such as in a metabolism cage or physical restraint in a sling, may severely compromise the welfare of the animals. Constraint in a metabolism cage or any similar type of housing for scientific purposes should be within a space that is as close as possible to minimum standard, and no less than that required for the animal to stretch fully, lie down and turn around.

The preferred flooring for dog accommodation is a solid continuous floor with a smooth non-slip finish. All dogs should be provided with a comfortable, solid resting area, for example, by the use of enclosure furniture such as raised beds or platforms. Open flooring systems such as grids or mesh should never be used for routine housing for dogs as they may cause injury to the animals, and should not be used at all unless there is a compelling scientific justification and Project Licence authority.²⁴ Where it must be used, great care should be taken in the design and construction in order to avoid pain, injury or disease and to allow the animals to manifest normal behaviours. A solid resting area should always be provided. If any welfare problems do arise which are related to the flooring, veterinary advice should be sought and, if necessary, the dogs relocated onto solid flooring.

The quality and finish of the floor of an outside run need not be to the standard of the inside enclosure, providing it is easily cleanable and not injurious to the dogs.

3.4 Feeding

See Chapter 1: Advice applicable to all animals.

3.5 Watering

See Chapter 1: Advice applicable to all animals.

3.6 Substrate, litter, bedding, and nesting material

When dogs are held on solid floors, some litter or substrate material facilitates cleaning and minimises the necessity for regular washing or hosing down. Periparturient and suckling bitches should be provided with a bed and bedding material to support whelping and the nursing of puppies. Puppies also benefit from the provision of bedding materials, as do the majority of adult dogs.

3.7 Cleaning

It is recommended to clean each occupied enclosure at least daily. It is advisable to remove all excreta and soiled materials from all areas used by dogs at least daily, and more frequently if necessary. Wet

²⁴ 'CoP' Standards applicable to all animals



cleaning by hosing down of enclosures should be carried out as necessary but should not result in the dogs becoming wet. When enclosures are hosed down, it is advisable to remove the dogs from the enclosure to a dry place and return them only when it is reasonably dry.

3.8 Handling and socialisation

Social behaviour in dogs develops between 4 and 20 weeks of age. During this period it is particularly important that the dog has social contacts with littermates, adult dogs (e.g. the bitch) and with humans, and is familiarised with conditions likely to be encountered during subsequent use. Daily handling during this sensitive stage of development is a prerequisite for the social behaviour of the adult dog and it has been shown that a short period of handling, even from the first day after birth onwards, is of importance as the young animals are already able to respond to scent and tactile stimulation.

3.9 Humane killing

See Chapter 1: Advice applicable to all animals.

3.10 Records

See Chapter 1: Advice applicable to all animals.

3.11 Identification

All dogs in a facility should be identified with a permanent and unique identification code before weaning. Individual animals can be identified visually by using properly fitted collars with attached medallions or tattoos. Tattoos are the least preferred method. Animals should be sedated for the purposes of tattooing and local or topical anaesthesia should be used; this will reduce stress in the animals and reduce the risk of injury to the handler. For some individuals general anaesthesia may be necessary – this should be judged on a case-by-case basis. Alternatively, the animal may be tattooed when anaesthetised for other purposes. Analgesia may be given before or after tattooing.

Microchips can be injected into accessible sites (usually the scruff of the neck). As it is important to be able easily to distinguish animals, some laboratories successfully use names for the animals. Ear notching or other mutilations are not considered appropriate methods.

The method of identification should be chosen with due consideration for the intended scientific use of the animal.



Chapter 6: Ferrets

This chapter must be read in conjunction with *the Cop, the Introduction and Chapter 1: Advice applicable to all animals*.

1 Environmental conditions

1.1 Ventilation

Adequate ventilation is important:

- to attenuate the animals' musk odour because of the impact it may have on the welfare of adjacent prey animal species, e.g. rodents;
- to minimise the risk of airborne respiratory diseases, to which the ferret is very susceptible.

1.2 Temperature

It is recommended to maintain ferrets in the temperature range of 15°C to 24°C. Ferrets do not have well-developed sweat glands, so to avoid heat exhaustion they should not be exposed to high temperatures.

1.3 Humidity

It is considered unnecessary to control or record relative humidity as ferrets can be exposed to wide fluctuations of ambient relative humidity without adverse effects. However, to minimise the occurrence of respiratory disease, it is recommended to avoid high humidity levels, especially if the temperature is low.

1.4 Lighting

It is considered good practice to ensure that the light source and type are not aversive to the animals. Particular care should be taken with ferrets in a tier racking system to ensure that animals in the top tier are not exposed directly to high intensity lighting. This is of particular concern with albino animals.

If natural light is totally excluded, it is recommended that low-level night lighting is provided to allow animals to retain some vision and to take account of their startle reflex. Holding of ferrets under the natural 24-hour light-dark cycle is acceptable. Where the light part of the photoperiod is provided by artificial lighting, it is recommended that this is a minimum of 8 hours and should generally not exceed 16 hours in any 24-hour period.

However, it should be noted that for the manipulation of the reproductive cycle variation in the light-dark cycles is necessary. For example, the light part of the photoperiod may be reduced to 6 hours and then increased up to 15 hours to stimulate oestrus in the female. The male requires opposite light cycles to the female to stimulate its season. Manipulation of the light cycle for males should commence several months before mating is required to ensure sperm maturity.

1.5 Noise

Lack of sound or auditory stimulation can be detrimental and make ferrets nervous. A soft and varied background noise may stimulate the sensory and social development of the young ferret. However, loud unfamiliar noise and vibration have been reported to cause stress-related disorders in ferrets and should be avoided where possible. It is important to consider methods of reducing sudden or unfamiliar noise in ferret facilities, including that generated by husbandry operations within the facility and also by ingress from outside sources. Ingress of noise can be controlled by appropriate siting of the facility and by appropriate architectural design. Noise generated within the facility can be controlled by noise absorbent materials or structures. It is advisable to seek expert advice when designing or modifying accommodation.

1.6 Alarm systems

See Chapter 1: Advice applicable to all animals.



2 Health

See Chapter 1: Advice applicable to all animals.

3 Housing, enrichment and care

The social behaviour of ferrets should be taken into account when housing animals. Regular interaction with other ferrets through group housing and regular confident handling by care staff should be encouraged as it results in better quality and more sociable animals.

Consideration should be given to the fact that the ferret is an intelligent, inquisitive, playful and agile animal, when designing the accommodation and when handling the animals. A complex, escape-proof enclosure is required. The ferret enjoys climbing and height provides some enrichment in itself.

3.1 Housing

Although the ferret's wild ancestors are generally solitary, there seem to be welfare benefits to housing ferrets in socially harmonious groups in captivity. Therefore, unless there is justification for singly housing them – on animal health or welfare grounds, or unless permitted by Project Licence authority – ferrets should be kept in socially harmonious groups.²⁵

When animals *are* single housed it is advisable to target additional resources to the welfare and care of these animals. Additional human socialisation time, and visual, auditory and, where possible, tactile contact with other ferrets is advisable for all single-housed animals on a daily basis.

Separation of animals that are normally group housed can be a significant stress factor. Where this is for a period of more than 24 hours it should be regarded as significantly compromising the welfare of the animals. Unless this is for animal health or welfare reasons, Project Licence authority is likely to be required. Constraint in less than minimum space requirements for scientific purposes, such as in a metabolism cage, may significantly compromise the welfare of the animals and is also likely to require Project Licence authority.

However, there are valid health and welfare reasons why single housing may be justified and required: ferrets usually breed once a year, mating in the spring. Male animals are hostile to, and will fight vigorously with, unfamiliar males during the breeding season. As a consequence, single housing of adult males may prove necessary at this time to avoid fighting and injury. However, males can be maintained successfully in groups at other times. It is recommended that pregnant females are housed singly only during late pregnancy, no more than two weeks prior to parturition.

Consideration should be given to the animals' species- and breed-specific needs when designing the enclosure. It should ideally be adaptable so that innovation based on new understanding may be incorporated. It is recommended that the enclosures are rectangular rather than square, to better facilitate locomotor activities.

During the design of the enclosure consideration should be given to the ferret's remarkable ability to escape. It should ideally be such that the animal is unable to escape or to injure itself should any such attempt be made. Their design and construction should seek to provide an open and light facility giving the ferrets comprehensive sight of other ferrets and staff, outside of their immediate animal enclosure. There should also ideally be provision for the ferrets to seek refuge and privacy within their own enclosure and, in particular, away from the sight of ferrets in other enclosures, enabling them to exercise some control over their social interactions.

Additional enclosure furniture such as beds or platforms is recommended to ensure the provision of all ferrets with a warm and comfortable resting place.

3.2 Enrichment

A complex enclosure provides opportunities for the ferret to exhibit a wide behavioural repertoire.

²⁵ See the 'CoP' Introduction: *Specifying deviations from CoP standards*.



Ferrets normally live in burrows, and thus in captivity they appreciate the provision of materials to stimulate both investigative and play behaviour. For example, tubes of cardboard or rigid plastic, paper bags into which they can crawl and play games are recommended. Water baths and bowls are also used extensively by ferrets.

The social housing of ferrets enriches the animals' environment and holding ferrets in large and socially harmonious groups increases the available floor space as well as enhancing socialisation opportunities.

Social behaviour in ferrets develops at an early age and it is important that the young ferret has social contacts with other ferrets (e.g. littermates) and with humans. Daily handling during this sensitive stage of development is a prerequisite for the social behaviour of the adult ferret. It is reported that the more frequent the interaction, the more placid the animal will become, and it is recommended that this interaction is continued through into adult life.

3.3 Dimensions and flooring

It is recommended that separate areas for different activities, such as by raised platforms and pen subdivisions, are provided in addition to the minimum floor space. It is advisable that the design of the floor space provides an adequate area for movement and allows the animal the opportunity to select sleeping, eating and urination/defecation areas.

Recommended flooring for ferret accommodation is a solid continuous floor with a smooth non-slip finish. Open flooring systems such as grids or mesh should not be used for ferrets as they may cause injury to the animals.²⁶

3.4 Feeding

Ferrets are obligate carnivores, feeding on small mammals, birds, fish and invertebrates. The ferret has a particular requirement for a high level of animal protein and fat, with little requirement for dietary fibre. Therefore ferrets can become protein-deficient if fed diets which have a high proportion of carbohydrates.

3.5 Watering

See Chapter 1: Advice applicable to all animals.

3.6 Substrate, litter, bedding and nesting material

The ferret in captivity requires a dry, warm sleeping chamber, discrete eating and food storage areas and a vertical surface for scent-marking well away from sleeping and eating areas. Nest boxes and/or plenty of nesting material should be provided and should be sufficient to contain the young ferrets within the nest. Care is needed in the choice of nesting material to avoid damage to young at birth such as desiccation or damage to the umbilical vessels.

Bedding material is required for all ferrets. In addition, hay, straw or paper are recommended as suitable nesting materials. Deep litter systems are considered to provide additional enrichment.

It is good practice to use some litter or substrate material at least to facilitate cleaning and minimise the necessity to wash/hose down regularly.

3.7 Cleaning

Consideration should be given to the need for animal enclosures, including the divisions between enclosures, to provide an easy-to-clean and robust environment for the ferrets.

It is considered good practice that wet cleaning by hosing down of animal enclosures does not result in ferrets becoming wet. When animal enclosures are hosed down, the ferrets should therefore ideally be removed from the enclosure to a dry place and returned only when it is reasonably dry.

²⁶ CoP' Chapter 1: *Standards applicable to all animals*



Ferrets tend to defecate against a vertical surface in one area of the enclosure. Provision of a litter tray may be beneficial and reduce the frequency of cleaning required for the remainder of the enclosure.

It is recommended that all excreta and soiled materials are removed at least daily, and more frequently if necessary, from litter trays and/or removed from all other areas used by the animals as a toilet.

Frequency of cleaning of the remainder of the enclosure should be determined according to factors such as stocking density, enclosure design and stage in the reproductive cycle.

3.8 Handling

See Chapter 1: Advice applicable to all animals.

3.9 Humane killing

See Chapter 1: Advice applicable to all animals.

3.10 Records

See Chapter 1: Advice applicable to all animals.

3.11 Identification

The preferred method of permanent identification is by microchipping. Animals can also be recognised by their faces as their colour and masks are distinctive. The use of coat dyes for albino animals may also be a suitable method of identification. Collars (as for cats) should be used with care as their neck and head circumferences are very similar, and collars may have to be unacceptably tight to reliably remain in place. Ear tattooing and ear tags are not considered to be suitable.

3.12 Considerations for breeding ferrets

As breeding can have a considerable impact on bodyweight and condition, it is strongly recommended that jills are assessed for continued suitability for mating in consultation with a veterinary surgeon. It is advisable not to mate females before nine months of age.

Mating can be a prolonged and noisy affair and can result in injury to the female (particularly neck injuries). Therefore, careful monitoring for injuries is important, as is seeking veterinary advice if/when they occur. It is recommended that mating takes place in a separate room to those animals with litters, as the disturbance can lead to cannibalism.

It is recommended that animals are not weaned before six weeks of age, unless there are good veterinary or husbandry reasons.



Chapter 7: Non-Human Primates

This chapter must be read in conjunction with the 'CoP', the Introduction and Chapter 1: Advice applicable to all animals.

1. Advice applicable to all Non-Human Primates

Non-human primates used for scientific research should be captive- and purpose-bred. When acquiring non-human primates, transport stress should be minimised in externally sourced animals by giving due consideration to journey durations and stages. If practicable, and if suitable expertise is available, it is preferable to rear non-human primates on or near to the site of experimental use. Captive-bred animals are of known age, parentage and health status and have been reared under standardised husbandry practices. Where non-human primates are to be imported they should, whenever possible, be obtained as F2+ offspring from established breeding colonies with high welfare and care standards similar to those outlined in the Codes of Practice issued by the International Primate Society (IPS) International Guidelines for the Acquisition, Care and Breeding of Non-Human Primates. It is highly desirable that they should be free from zoonotic diseases.

The use of wild-caught non-human primates in scientific procedures is prohibited on ethical grounds, unless there is exceptional and specific scientific justification. Such animals present health hazards to staff, have unknown histories and are likely to be more afraid of humans. In some instances there can be a significant mortality among the animals at the trapping site and during transfer to the source country holding site.

1.1 Environmental conditions

1.1.1 Ventilation

See Chapter 1: Advice applicable to all animals.

1.1.2 Temperature

As in captivity the animals have restricted opportunities for natural behavioural means of coping with climatic change, the ranges specified will not necessarily reflect those which they experience in nature. Generally the ranges will be those which are optimal for the animals and comfortable for staff. Where outdoor enclosures are in use, it is extremely important to provide shade and shelter from inclement weather for all individuals and continuous access to adequate heated indoor accommodation. This is of particular importance in breeding colonies with extensive outdoor enclosures to reduce the risk of frostbite and loss of neonates in the winter months.

1.1.3 Humidity

Although some non-human primates live in tropical rain forests, where humidity is high, and others in arid regions, it is not necessary for this to be replicated in facilities for established colonies. In general, humidity levels of 40 to 70% are comfortable for both animals and care staff. Care should be taken (see individual species) not to expose the animals to humidity which is too low and prolonged exposure outside this range should be avoided, particularly for New World monkeys, which may be susceptible to respiratory problems.

1.1.4 Lighting

It is recommended that most non-human primates have a 12h/12h light/dark cycle. Simulated dawn and dusk lighting may be beneficial for some species and will minimise the risks of injury caused to animals if they are startled by a sudden change in light intensity. For the nocturnal species, such as *Aotus trivirgatus*, it is recommended that the cycle is modified so that dim red light is used during part of the normal working day to allow the animals to be observed during their active periods, and also to enable routine husbandry tasks to be carried out safely. Whenever possible, rooms housing non-human primates should be provided with windows, since they are a source of natural light and can provide environmental enrichment.



1.1.5 Noise

For most species, satisfactory sound levels will be the same as those recommended for staff, but some species such as callitrichids can also hear ultrasound, so this should be taken into account. It is recommended that the level of background noise is kept low and is only allowed to exceed 65dBA for short periods, so that vocal communication between animals is not inhibited.

1.1.6 Alarm systems

Most higher non-human primates have similar hearing to humans. To avoid frightening the animals it is advisable that sirens are avoided. An appropriate alternative would be to use flashing lights visible to staff in all rooms.

1.2 Health

Though the use of captive-bred animals should ensure that they are in good health and do not pose a risk of infection to staff or other non-human primates in the premises, it is strongly recommended that all newly acquired animals arrive with full health certification and be quarantined on arrival. During this period it is advisable to closely monitor their health, and further serological, bacteriological and parasitological tests should be performed by competent laboratories as required.

Best practice is for all non-human primates in the colony to be under expert veterinary control and submitted to periodic health screening. Their close affinity to humans results in susceptibility to a number of diseases and parasites that are common to both and occasionally life threatening to the other. It is, therefore, of vital importance that there is also regular medical screening of the staff. Any member of staff posing a potential health risk to the animals should not be allowed to have contact with the animals. Particular care should be taken when dealing with animals which may be contaminated by pathogens transmissible to humans. Staff should be informed, and measures taken to minimise the risk of infection. The health records should form part of the individual history file for each animal.²⁷ It is strongly recommended that the investigation of unexpected morbidity and mortality is thorough, having regard for potential zoonotic diseases, and be conducted under the direction of the NVS.

It is strongly advised to prepare plans to prevent or deal with possible disease outbreaks in consultation with the NVS. It is also advisable that an effective health monitoring system is maintained and available for inspection. All animals should be observed daily for signs of illness or injury and it is recommended that they are also observed for psychological well-being by an experienced animal care person familiar with the species. Individual animals showing evidence of disease or injury which warrants isolation should be removed and given appropriate treatment.

It is strongly recommended that non-human primates from different sources are strictly separated from each other until their health status has been ascertained. Physical separation of animals by species is generally recommended to prevent inter-species disease transmission and to reduce the stress caused by inter-species conflict. New World, Old World African and Old World Asian non-human primates should normally be housed separately as latent infections in one group can cause serious clinical disease in others.

In outdoor enclosures, vermin control is of particular importance.

1.3 Housing, enrichment and care

1.3.1 Housing

It is strongly recommended that a person competent in the behaviour of non-human primates is available for advice on social behaviour, environmental enrichment strategies and management.

Because the commonly used non-human primates are social animals, they should be housed with one or more compatible conspecifics. To ensure harmonious relations, it is essential that the group composition of non-human primates should be appropriate. Compatibility, and hence group composition, in terms of the age and sex of its members depends on the species. In creating groups,

²⁷ See 'Guidance on the Operation of the Animals (Scientific Procedures) Act 1986', section 3.13.13.



the natural social organisation of the species should be taken into account. In confined conditions, however, where the space for extended chases or the emigration of social rejects is not available, the natural age and sex composition of troops may be inappropriate, and modifications to group structure may be required. For example, a harem structure may be substituted for the natural multi-male, multi-female troop in macaques. Experimental protocol may also determine group composition, for example, single-sex or same-age groups. Visual barriers, which allow the animals to be out of sight of one another, are important in group housing and multiple escape routes provide opportunities to avoid attacks and also prevent dominant individuals from restricting access of subordinates to other parts of the enclosure.

Careful monitoring of animals is necessary following grouping or mixing, and a programme of action should be in place for managing and minimising aggressive interaction.

Where animals are housed in same-sex groups, it is best to avoid housing the two sexes in close proximity, as this can sometimes lead to the males becoming aggressive.

If authorised, single housing should be for as short a time as possible under close supervision.²⁸ It is strongly recommended that additional resources should be targeted to the welfare and care of these animals. For animals where housing them in large groups is not possible, keeping them in same-sex compatible pairs is probably the best social arrangement.

Where socially housed animals need to be separated for a period of time, for example, for dosing or for veterinary treatment, care and vigilance should be exercised on re-introduction as the social organisation in the group may have changed and the animal may be attacked. Possible solutions include confinement of this animal to an individual enclosure attached to, or within, the main living area or separation of all individuals briefly followed by re-introduction of the whole group simultaneously.

1.3.1a Outdoor enclosures

It is strongly recommended that where possible, non-human primates should have access to outdoor enclosures. These are commonly used for breeding larger non-human primates. They have the advantage for the animals that they can include many features of the natural environment and are also useful for holding stock or experimental animals where close climatic control is not required and outdoor temperatures are suitable.

Outdoor enclosures are usually constructed of metal, but other materials, including wood, can be used providing it is suitably weather-proofed. Some types of wood are approved by toxicologists provided that a certificate of analysis is available. Wood is easily maintained or replaced, can be custom-built on site and provides a quieter and more natural material. To protect the structural integrity of a wooden enclosure, it is recommended that the framework is either a type of wood which the animals will not chew or that it is protected with mesh and a non-toxic treatment. The base of the enclosure can be of concrete or natural vegetation. It is recommended that either part of the outdoor enclosure is roofed, to allow the animals to be outside in wet weather and to provide protection from the sun. Alternatively, shelters can be provided.

Where outdoor enclosures are provided, the non-human primates will utilise them even in the winter. However, it is strongly recommended that heated indoor enclosures are also provided. In some species (e.g. cynomolgus macaques) outdoor access may need to be managed in cold weather to avoid problems such as frostbite to extremities.

Outdoor runs should be viewed as complementary to indoor space and should not be used as a substitute for good quality indoor accommodation. Where indoor and outdoor facilities are provided, it is recommended that equal enrichment and opportunities for foraging and play are provided in both areas, so that there is a genuine choice. Where different enclosures are connected, for example outdoor and indoor, it is recommended that more than one connecting door is provided to prevent subordinates being trapped by more dominant animals.

Adequate monitoring of health status and management of health risks are essential for animals with access to outdoor runs. Special consideration should be given to socialisation and training programmes in order to minimise any stress associated with capture, handling or use in procedures.

²⁸ See 'CoP' Introduction: *Specifying deviations from CoP standards*.



1.3.1b Indoor housing

Although indoor enclosures will commonly be constructed of metal, other materials, such as wood, laminates and glass have been used successfully and may provide a quieter environment.

As height is a critical feature of the enclosure, all non-human primates should be able to climb, jump and occupy a high perch. The walls can include mesh to allow climbing but sufficient diagonal branches or perches should also be provided to allow all animals to sit on them simultaneously. This is considered the minimum provision to produce space of sufficient complexity to allow expression of a wide range of normal behaviour for non-human primates.²⁹ Where mesh or horizontal bars are used, care should be taken to ensure that they are of a type which could not lead to injury through animals having their limbs trapped.

Solid floors have the advantage that they can be covered with a substrate in which food can be scattered to encourage foraging. Non-human primates require space for activity, but may need to be confined in smaller home enclosures for short periods of time when justified on veterinary or experimental grounds. Smaller volumes can be created by partitioning the main enclosure using dividers and/or a mobile back to the enclosure, having a cage within the home enclosure, two linked units, or attaching experimental enclosures to a larger exercise enclosure. These methods of confining animals all have the advantage that animals have access to a satisfactory living environment and social companions, while allowing separation for feeding, cleaning and experimental purposes, such as dosing and blood sampling.

More space for activity can be provided by keeping non-human primates in large groups, rather than pairs. Individuals can be isolated by training or running the group through a race with a trap in it.

1.3.1c Breeding

The sex ratio and numbers of animals in a breeding colony will depend on the species involved. It is important to ensure that both space and complexity are adequate to prevent the intimidation of individuals, particularly low-ranking females and young. Multiple food and water sites should be available in order to limit competition. In polygamous species, it is recommended that the sex ratio ensures that the majority of females are mated and give birth to live offspring. Where there is more than one male in the group, care should be taken to ensure that the males are compatible. Monogamous species will be bred in family groups with a breeding pair and two or more sets of their offspring.

For future breeding animals, it is important that the young grow up in stable social groups, preferably their natal group, with their mothers. This ensures that their parenting skills and social interactions within a hierarchical structure develop adequately.

Animals will normally successfully rear single or twin offspring without intervention. However, a management policy for rejected infants is strongly recommended to minimise suffering in these animals, including strategies to reduce the incidence of long-term behavioural abnormalities.

1.3.1d Separation from the mother

Young animals have a slow post-natal development lasting several years in Old World primates with a period of dependency on their mothers lasting until they are 8 to 12 months old, depending on the species. During this period they learn about their environment under the mother's protective vigilance and socialise through interactions with a diversity of social partners. They also learn parenting skills by interacting with infants or even helping to care for them. Separation of infants from a colony causes distress to the mother and infant at the time. It is therefore preferable to leave them in their natal colony until they have become independent. Should they, for their own welfare, have to be weaned or separated earlier, it is advisable to incorporate them into a well-organised group to avoid damage to their social development, behaviour, physiology and immune competence. The appropriate age ranges for weaning will depend on the species. It is advisable to use weight, health and behavioural criteria

²⁹ 'CoP' Standards applicable to all animals and Standards applicable to non-human primates



to determine the most appropriate weaning age for the welfare of each individual monkey. Minimum weaning ages are given in Chapter 7.

1.3.2 Enrichment

The precise features of the living quarters will vary according to species, due to differences in natural behaviour. Materials providing tactile stimuli are valuable. It is recommended that some novelty is introduced at intervals, which can include for example minor changes in the conformation or arrangement of enclosure furniture and feeding practices.

In addition to their wild nature and climbing habits, non-human primates have advanced cognitive capabilities and complex foraging and social behaviour. As a result, they require complex, enriched environments to allow them to carry out a normal behavioural repertoire.³⁰

1.3.3 Dimensions and flooring

In contrast to non-arboreal mammals, the flight reaction of non-human primates from terrestrial predators is vertical, rather than horizontal; even the least arboreal species seek refuge in trees or on cliff faces. As a result, consideration should be given to an adequate enclosure height that allows the animal to perch at a sufficiently high level for it to feel secure.³¹ The structural division of space in primate enclosures is of paramount importance. It is essential that the animals should be able to utilise as much of the volume as possible because, being arboreal, they occupy a three-dimensional space. To make this possible, perches and climbing structures should be provided.

The following factors will determine the enclosure dimensions for a given species:

- the adult size of the animal (juvenile animals, though smaller, are usually more active than adults, thus requiring similar space allowances for physical development and play);
- sufficient space to provide a complex and challenging environment; and
- the size of group to be accommodated.

The following principles are strongly recommended for the housing of all species of non-human primates:

- enclosures should be of adequate height to allow the animal to flee vertically and sit on a perch or a shelf, without its tail contacting the floor or head touching the roof of the cage;
- enclosures should not be arranged in two or more tiers vertically.

Concrete-floored enclosures can be covered with a suitable non-toxic substrate.

It is strongly recommended that indoor accommodation meets the minimum dimensions specified in the CoP, without inclusion of outdoor areas.

1.3.4 Feeding

Foraging is a very important behaviour and a good form of enrichment. Presentation and content of the diet should ideally be varied. Scattering food will encourage foraging, or where this is not possible it is recommended that food is provided which requires manipulation, such as whole fruits or vegetables, or puzzle-feeders can be provided. Consideration should be given to minimising contamination when designing foraging devices and structures. Vitamin C is an essential component of the primate diet. New World monkeys also require adequate quantities of vitamin D3. As the enrichment feeding may lead to preferences, to ensure that the animals receive a balanced diet it is advisable to feed the standard diet first thing in the morning when the animals are hungry and when no alternative is offered. It is advisable to scatter the food to ensure that it is not monopolised by dominant individuals. A varied diet is recommended unless it is likely to have disturbing effects on experimental results. However, in such circumstances variation can be introduced in the form of nutritionally standard diets available in different shapes, colours and flavours. It is recommended that feeding regimes are carefully designed to ensure positive effects are maximised and possible adverse effects such as dietary imbalance or

³⁰ In order to meet the requirements of the 'CoP' *Standards applicable to non-human primates*

³¹ In order to meet the requirements of the 'CoP' *Standards applicable to non-human primates*



unwanted behaviours (e.g. aggression) are minimised. The positioning of watering points should also take into account dominance and aggression issues.

1.3.5 Watering

See Chapter 1: Advice applicable to all animals.

1.3.6 Substrate, litter, bedding and nesting material

Some non-human primates, for example some prosimians, require nesting material, for example wood, wool, dry leaves or straw. Non-toxic substrates such as wood chips, wood granulate with a low dust level or shredded paper are valuable to promote foraging in indoor enclosures. Grass, herbage, wood chip or bark chip are suitable for outdoor facilities.

1.3.7 Cleaning

See Chapter 1: Advice applicable to all animals.

1.3.8 Handling

Keeping non-human primates for research purposes creates a number of problems which are not shared with other mammals commonly used in research. Non-human primates are not domesticated, but are wild animals; most are also arboreal. Their lack of domestication causes them to be highly reactive to any unfamiliar and alarming stimuli. Unlike domesticated species, they have not been selected for friendliness to humans and low aggression. Early friendly contact between infants and care-givers will result in a less fearful animal, as the animals learn that familiar humans do not constitute a threat, but the animals will retain most of the attributes of their wild conspecifics.

Various methods of restraint are employed in handling non-human primates, ranging from enclosures with sliding partitions, through netting, holding the animals manually, to using a dart to tranquillise them. Although non-human primates dislike being handled and are stressed by it, training animals to cooperate should be encouraged, as this will reduce the stress otherwise caused by handling. Training the animals is a most important aspect of husbandry, particularly in long-term studies. It has a dual advantage in providing the animal with an intellectual challenge and making work more rewarding for the care-giver. Non-human primates will respond to aural and visual stimuli and, by using simple reward systems, training can often be employed to encourage the animals to accept minor interventions, such as blood sampling.

It is recommended that the response of individuals to training and procedures is regularly reviewed, as some animals may be particularly difficult or non-responsive and in such cases, careful consideration should be given to their continued use.

Though animals can be trained to accomplish tasks, it is important that attention is paid to appropriate recovery periods when subjected to repeated experiments.

The use of a net as a method of capture for non-human primates is strongly discouraged, except in specific, exceptional circumstances, for example in order to catch an escaped animal where there is no possible alternative strategy. Where possible, alternative methods should be used.

1.3.9 Humane killing

See Chapter 1: Advice applicable to all animals.

1.3.10 Records

It is a standard condition of the Establishment Licence that an individual history file is kept for each non-human primate.³²The minimum information required in this individual history file is outlined in the Guidance.³³ It is advisable that records include information regarding: species, sex, weight, clinical and diagnostic information, present and previous housing system, history of experimental use and any other information relevant for management and experimental procedures, such as reports on

³² *Standard Condition 9 of the Establishment Licence.*

³³ See 'Guidance on the Operation of the Animals (Scientific Procedures) Act 1986', section 3.13.13.



behaviour or status, and favoured social companions/social relationship. Good records will assist in the assessment of the lifetime experience of the individual animal and the cumulative severity of all these experiences, including – but not limited to – scientific procedures and their effects.

1.3.11 Identification

All non-human primates in a facility should be identified with a permanent and unique identification code before weaning. Individual animals can be identified visually by using properly fitted necklaces with attached medallions or tattoos for large species. Tattoos are the least preferred method. Animals should be sedated for the purposes of tattooing and local or topical anaesthesia should be used; this will reduce stress in the animals and reduce the risk of injury to the handler. For some individuals general anaesthesia may be necessary – this should be judged on a case-by-case basis. Alternatively, the animal may be tattooed when anaesthetised for other purposes. Analgesia may be given before or after tattooing.

Microchips can be injected into accessible sites (the wrist for larger animals or scruff of the neck for smaller species). As it is important to be able easily to distinguish animals, some laboratories successfully use names for the animals, as these can easily be used to identify dominant and subordinate animals, and are considered by some to encourage the care staff to increase their respect for the non-human primates. Ear notching or other mutilations are not considered appropriate methods.

The method of identification should be chosen with due consideration for the intended scientific use of the animal.

1.4 Training

It is strongly recommended that staff are trained in the management, husbandry and training of animals under their care. For animal carers and scientists working with non-human primates, training should include species-specific information. This should include the biological, psychological and behavioural characteristics and requirements of the species, environmental enrichment, methods used for the introduction and removal of animals and social dynamics. Comprehensive training and supervision should be provided by experienced, competent staff only. It should include the catching and handling of non-human primates in a safe and humane manner, methods of restraint and humane methods of killing.

It is strongly recommended that training should also include information on the health and safety of staff working with non-human primates including zoonotic disease risk, management and security.

1.5 Transport

Animals should, where possible, be transported in compatible pairs. However, adult animals may need to be transported singly. Juvenile monkeys should preferably not be separated from one another as this increases stress. If this is not feasible they should preferably be transported in partitioned containers or in separate containers loaded adjacent to each other. Monkeys of the same species and sex may be transported together in the same container only if they have previously been shown to be compatible.

Transport of non-human primates outside the EU must comply with the International Air Transport Association's regulations relating to live animals including the design and construction of containers, and these regulations may be taken into consideration when planning transport within the EU.

1.5.1 Receipt

It is strongly recommended that animals are removed from their transport containers soon after they arrive. Particular care should be taken during handling at this time to minimise the stress caused to the animal and to guard against escapes. After inspection it is advisable that they should be transferred to their home enclosure, and be provided with food and water without delay. Where possible, food of a type familiar to them should be offered and new diets introduced gradually.



Sick or injured animals should receive prompt veterinary attention. Where animals have died during transit or soon after arrival it is strongly recommended that a post-mortem examination is performed to ascertain the cause of death. The supplier should be informed and action taken to minimise the risk of any recurrence. Good practice dictates that a record should be made of each individual animal received, including its source, date of arrival and health status.

A period of acclimatisation is strongly encouraged to enable animals to recover from any transport stress and to become accustomed to their new environment. The required acclimatisation period will vary with the species, the journey and the facilities available. Imported animals are subjected to other statutory controls.

1.5.2 Despatch

Non-human primates fear unfamiliar environments encountered during transport. There are a number of basic principles which the carrier should follow in order to ensure the welfare and comfort of the animal and which will influence the animal's behaviour during transport. Stress may cause the animal to become difficult to manage. It is natural for monkeys to investigate their surroundings and try to escape. With very few exceptions, monkeys do not willingly accept confinement and will often make determined efforts to escape. Familiarisation with the transport box prior to travel can reduce stress to the animal. It is strongly recommended that transport containers are of a suitable design and construction to minimise risk of escape. It is also advisable that vehicles used for transport have two sets of doors/gates into the animal compartment, with a viewing port in the inner door.

Transportation of monkeys suckling young should not normally be undertaken. Some females, sensing danger, may harm their young. However, in exceptional circumstances nursing monkeys have to be transported, it is advised that they are carried together with their young but separated from other members of the group.

Food and moisture should be provided. It is recommended that a small quantity of fresh fruit or vegetables is put in the container during packing.

Most species can withstand reasonable variations in temperature but exposure to wind in combination with cold can be fatal. Consideration therefore should be given not only to the temperature fluctuations but also to the chill factors involved. Monkeys should never be exposed to direct heat, for example by placing them in direct sunlight or against hot radiators from where they are unable to escape.

1 Additional advice applicable to marmosets and tamarins

Marmosets (*Callithrix spp.*) are small, highly arboreal, South American diurnal non-human primates. In the wild they have home ranges of 1 to 4 hectares where they live in extended family groups of 3 to 15 animals consisting of a breeding pair and their offspring. Females produce litters twice a year (normally twins, and in captivity not infrequently triplets) and all group members take care of the offspring. Reproductive inhibition of the subordinate females by the dominant occurs due to hormonal and behavioural mechanisms. Marmosets are frugivore-insectivore and are specialised in gum-tree gouging and gum feeding; however, in captivity they will gouge and scent-mark other hardwoods. Foraging and feeding occupy up to 50% of the time available. Marmosets and tamarins can live for up to 15 to 20 years in captivity.

Tamarins (*Saguinus spp.*) are similar to marmosets in many respects. They are found in South and Central America, but are slightly larger animals and have larger home ranges, varying from 30 to 100 hectares. The larger home ranges of tamarins are related to more frugivorous diets, while they do not gouge, and eat gum only when readily accessible.

Most marmosets and tamarins show reluctance to descend to the ground and frequently scent-mark their environment.



1.1 Environmental conditions

1.1.1 Ventilation

See Part 1: Advice applicable to all Non-Human Primates.

1.1.2 Temperature

It is recommended that marmosets and tamarins are maintained in a temperature range of 23°C to 28°C, although levels slightly higher are acceptable due to the tropical nature of the animals. Wide fluctuations should ideally be avoided.

1.1.3 Humidity

Humidity levels of 40 to 70% are recommended, although the animals will tolerate relative humidity levels higher than 70%. Low levels of relative humidity should normally be avoided.

1.1.4 Lighting

A photoperiod of no less than 12 hours of light is recommended. It is advisable for the lighting source to illuminate uniformly the holding room and permit adequate observation of the animals. However, within the animal enclosures, it is recommended that a shaded area is always provided.

1.1.5 Noise

Special consideration should be given to minimise exposure to ultrasound, which is within the hearing range of marmosets and tamarins.

1.1.6 Alarm systems

See Part 1: Advice applicable to all Non-Human Primates.

1.2 Health

See Part 1: Advice applicable to all Non-Human Primates.

1.3 Housing, enrichment and care

1.3.1 Housing

It is recommended that marmosets and tamarins are housed in family groups consisting of unrelated male-female pairs and one or more sets of offspring. Groups of stock animals will normally consist of compatible same-sex peer individuals or juveniles. Care should be taken when grouping unrelated adult individuals of the same sex since overt aggression may occur.

During experiments, marmosets and tamarins can generally be kept with a compatible same-sex animal (twins, parent/offspring) or in male-female pairs, using contraception or vasectomised males. When experimental procedures or veterinary care require single housing, the duration should be minimised and the animals should remain in visual, auditory and olfactory contact with conspecifics.

Breeding pairs should normally be formed only when the animals are aged about two years. In family groups, the presence of the mother will inhibit the ovulatory cycle in her female offspring. It is recommended that new pairs intended for breeding are not kept close to the parental family since reproduction may be inhibited. When animals are to be used as breeders, it is advisable that they remain in the family group until at least 13 months of age in order to acquire adequate rearing experience.

1.3.2 Enrichment

The natural behaviour of marmosets and tamarins indicates that the captive environment should provide some degree of complexity and stimulation, factors which are more valuable than simply



increasing enclosure dimensions to promote species-typical behaviour.³⁴ Furniture of natural or artificial materials (for example, wood, PVC) may include perches, platforms, swings and ropes. It is important to provide a certain degree of variability in orientation, diameter and firmness to allow the animals to perform appropriate locomotor and jumping behaviours. Wooden perches allow marmosets and tamarins to express their natural behaviour of gnawing followed by scent-marking. In addition, comfortable secure resting areas such as nests are recommended since they are used for resting, sleeping and hiding in alarming situations.³⁵ Though visual contact between family groups is normally stimulating for the animals, opaque screens and/or increasing the distance between enclosures in order to avoid territorial interaction may be needed in some cases, and in particular for certain callitrichid species. It is advisable to suspend or present foraging devices, which stimulate the natural behaviour of the animals, in the upper part of the enclosure, in consideration of the reluctance of the animals to descend to ground level. Wood chips as a substrate will encourage foraging of spilled food at the floor area. In general, the inclusion in the lower part of the enclosure of structural elements and enrichment devices will promote a wider and more diversified use of the space. For marmosets, which are specialised in tree-gnawing to obtain gum, sections of dowel drilled with holes and filled with gum arabic have proved very beneficial.

1.3.3 Dimensions and flooring

For marmosets and tamarins the volume of available space and the vertical height of the enclosure are more important than floor area, due to the arboreal nature and the vertical flight reaction of these species. Consideration of the purpose for which the animals are maintained (breeding, stock, short or long experiments) is important in determining the minimum dimensions and design of the enclosure, and it is important that this enables the inclusion of sufficient devices for improving the environmental complexity.

1.3.4 Feeding

Marmosets and tamarins require a high protein intake and since they are unable to synthesise vitamin D3 without access to UV-B radiation, the diet will normally require supplementation with adequate levels of vitamin D3.

1.3.5 Watering

See Part 1: Advice applicable to all Non-Human Primates.

1.3.6 Substrate, litter, bedding and nesting material

See Part 1: Advice applicable to all Non-Human Primates.

1.3.7 Cleaning

Marmosets and tamarins frequently scent-mark their environment and the total removal of familiar scents may cause behavioural problems. Alternate cleaning and sanitation of the enclosure and the enrichment devices retains some of the territorial scent-marking and has beneficial effects on the psychological well-being of the animals, reducing over-stimulated scent-marking.

1.3.8 Handling

Regular handling and human contact are beneficial for improving the animals' habituation to monitoring and experimental conditions and facilitate training to cooperate with some procedures. When capture and transport of the animals are required, nest boxes can be used to reduce handling stress.

1.3.9 Humane killing

See Part 1: Advice applicable to all Non-Human Primates.

³⁴ In order to meet the requirements of the 'CoP' Standards applicable to non-human primates

³⁵ In order to meet the requirements of 'the CoP' Standards applicable to non-human primates



1.3.10 Records

See Part 1: Advice applicable to all Non-Human Primates.

1.3.11 Identification

See Part 1: Advice applicable to all Non-Human Primates.

2 Additional advice applicable to squirrel monkeys

Squirrel monkeys (*Saimiri spp.*) inhabit the tropical rain forests of the South American continent at various altitudes. There are various regional subspecies, the two most important are known as *S. sc. boliviensis* (black headed) and *S. sc. sciureus* (olive). In addition to differences in coat colour and face masks they also have some minor variations in behavioural characteristics. Body weight of adults ranges from 600 to 1100 g, with males being distinctly heavier than females. Standing upright, adult animals reach about 40 cm body length. They are typically arboreal animals living at different levels of the canopy, depending on environmental temperature. They do, however, descend to the ground to look for food and, and in the case of young animals, to play. When in danger, they flee to a high level. When travelling, they may take leaps depending on the density of the canopy. In the wild they live in fairly large groups in which females and young animals live together with a dominant breeding male, whereas adult males that are not in breeding condition remain on the periphery, forming groups of their own. Squirrel monkeys in captivity have been known to live for up to 25 years.

2.1 Environmental conditions

2.1.1 Ventilation

See Part 1: Advice applicable to all Non-Human Primates.

2.1.2 Temperature

Though the species live in a wide range of climatic conditions in tropical forests from low to high altitudes in mountain areas, temperatures in the habitats of individual colonies or troops do not vary greatly. Therefore marked short-term temperature variations are best avoided. In the wild the animals adapt to ambient temperatures by choosing the most suitable level within the canopy (for example, nearer to the ground in cool weather). Whereas normal room temperatures of 22°C to 26°C seem to be adequate, for animals with restricted exercise areas temperatures around 26°C may be more appropriate.

2.1.3 Humidity

A range of 40 to 70% is adequate for this species.

2.1.4 Lighting

As tropical-forest dwellers, squirrel monkeys are adapted to diffuse lighting. Nevertheless, for animals without access to outdoor enclosures, the provision of areas with high intensities of light similar to daylight is recommended. The light spectrum should ideally resemble daylight even though the light intensity need not be that of bright sunshine. A 12-hour/12-hour light/dark cycle is appropriate, and in all cases it is advisable that the daylight period is not less than eight hours. The addition of a UV component or time-limited exposure to UV lamps would enable essential vitamin D3 synthesis in the skin.

2.1.5 Noise

See Part 1: Advice applicable to all Non-Human Primates.

2.1.6 Alarm systems

See Part 1: Advice applicable to all Non-Human Primates.



2.2 Health

Squirrel monkeys may be silent carriers of a herpes virus (Saimirine herpesvirus 1, syn. Herpesvirus tamarinus, herpes T, Herpesvirus platyrrhinae), which, when transmitted to marmosets, may prove fatal. It is, therefore, recommended to not keep these two animal species in the same units unless tests have shown the colonies to be free from this viral infection.

2.3 Housing, enrichment and care

2.3.1 Housing

Based on their natural social organisation there is no difficulty in keeping squirrel monkeys in large single-sex groups. For this purpose, however, it is advisable to keep male and female groups well separated to avoid fighting. Special attention should be paid to identify distressed individuals in a group since aggressive behaviour is not very pronounced in squirrel monkeys.

For breeding purposes a group of seven to ten females kept with one or two males appears to be adequate. In captivity, breeding groups will normally consist of a minimum of three females, as smaller numbers do not show regular reproductive cycling. Breeding groups should normally have visual contact, but should be prevented from physical contact, with other groups. Newborn animals are carried on the backs of their mothers until they are about six months old. However, they leave their mothers for exploration or are carried by close relatives at quite an early stage. They thus learn to socialise and, frequently through vocalisations, discover what may be dangerous or beneficial for them. The animals take up solid food from the age of three months onward. Nevertheless it is recommended that young animals should not be separated from their families before nine to ten months of age or, if hand feeding is necessary, they can be placed for adoption by another female, if possible, in their natal group. Squirrel monkeys reach sexual maturity at about the age of three years.

Breeding groups, once established, should not be disturbed, to avoid reduction in breeding performance. Major environmental and social changes should thus be avoided.

Squirrel monkeys should preferably be kept in groups of four or more animals.

2.3.2 Enrichment

As arboreal animals, squirrel monkeys need sufficient climbing possibilities which can be provided by wire-mesh walls, poles, chains or ropes. Though they do leap over gaps if provided with structures, they prefer to run along or swing on horizontal and diagonal branches or rope bridges. Perches or nest boxes where they can sit huddled together for resting and sleep will be utilised.

A solid base with a substrate encourages foraging activity and play. It is recommended that the animals are offered a choice of sites within the enclosure to allow for activity, to enable them to retreat from social contact and to allow them to select comfortable temperatures and lighting conditions. Facilities should be provided for females giving birth to withdraw from the rest of the group.

2.3.3 Dimensions and flooring

See Part 1: Advice applicable to all Non-Human Primates.

2.3.4 Feeding

Squirrel monkeys require a high animal protein intake and standard monkey diets are generally inadequate in this respect. They require supplementation with, for example, arthropods (mealworm), egg or cheese and they should be given citrus fruit. As with other South American species, squirrel monkeys require high levels of vitamin D3 in addition to vitamin C. Pregnant females are susceptible to folic acid deficiency, and consideration should be given to providing them with an appropriate powder or liquid supplement containing synthetic folic acid.

2.3.5 Watering

See Part 1: Advice applicable to all Non-Human Primates.



2.3.6 Substrate, litter, bedding and nesting material

See Part 1: Advice applicable to all Non-Human Primates.

2.3.7 Cleaning

See Part 1: Advice applicable to all Non-Human Primates.

2.3.8 Handling

Squirrel monkeys can be trained to come forward for titbits or drinks as rewards. They are also capable of learning how to solve tasks for reward. For catching for investigation or treatment, animals should be trained to enter gangways with trap cages or individual enclosures.

2.3.9 Humane killing

See Part 1: Advice applicable to all Non-Human Primates.

2.3.10 Records

See Part 1: Advice applicable to all Non-Human Primates.

2.3.11 Identification

See Part 1: Advice applicable to all Non-Human Primates.

3 Additional advice applicable to macaques and vervets

The three species of macaque which are most commonly kept for research purposes all originate from Asia: *Macaca mulatta* (the rhesus monkey), *Macaca fascicularis* (the long-tailed, crab-eating or cynomolgus macaque) and *Macaca arctoides* (the stump-tailed or bear macaque). The vervet (*Cercopithecus aethiops* or *Chlorocebus aethiops*) is a rather similar type of African monkey sometimes kept in laboratories. In the wild, all of these species live in matriarchal multi-male/multi-female groups. There are both male and female dominance hierarchies and females form kinship groups within the troop. Social bonds are strongest between related females, and males compete for access to females in oestrus. Two species, the rhesus monkey and stump-tailed macaque live in warm to temperate climates, while the long-tailed macaque is an exclusively tropical species which particularly favours mangrove swamps and often forages in water. The long-tailed macaque is the most arboreal of the four species and the stump-tailed macaque the most terrestrial. The vervet has a wide range of African habitats, including open grasslands, forests and mountains, with climatic conditions ranging from warm temperate to tropical. Rhesus monkeys are seasonal breeders while the other species breed all year round in captivity. Macaques and vervets in captivity have been known to live for more than 30 years.

3.1 Environmental conditions

3.1.1 Ventilation

See Part 1: Advice applicable to all Non-Human Primates.

3.1.2 Temperature

Rhesus monkeys and stump-tailed macaques are tolerant of temperate climates. Vervets are also adaptable and temperatures of 16°C to 25°C are suitable. For the long-tailed macaque, however, a more suitable range is 21°C to 28°C, although it will venture outdoors in much cooler weather. In exclusively indoor accommodation temperatures can be maintained in the range 15°C to 24°C, normally 19°C to 23°C for staff comfort.



3.1.3 Humidity

See Part 1: Advice applicable to all Non-Human Primates.

3.1.4 Lighting

See Part 1: Advice applicable to all Non-Human Primates.

3.1.5 Noise

See Part 1: Advice applicable to all Non-Human Primates.

3.1.6 Alarm systems

See Part 1: Advice applicable to all Non-Human Primates.

3.2 Health

Old World monkeys belong to the most susceptible species for tuberculosis and a high percentage of Asiatic macaques in the wild are silent carriers of Herpes B (syn. Herpes simiae, Cercopithicine herpesvirus 1). Vervets may also be susceptible to Marburg Virus and Ebola Virus.

3.3 Housing, enrichment and care

3.3.1 Housing

Macaques and vervets should be kept with social companions. Should larger groupings be feasible, this should be encouraged. Same-sex groups are most easily created at the time when the animals are separated from their mothers. With all social housing, staff should be vigilant to ensure that aggression is minimised. Vervet colonies are particularly prone to outbreaks of violence, especially after any form of disturbance to the group.

Breeding groups in captivity will usually be composed of 1 male and 6 to 12 females. With larger groups, to improve conception rates, two males can be included. If one male is considerably younger than the other, competition between them will be reduced until such time as the younger male becomes more mature and the older male more debilitated. At this time, which is frequently unpredictable, there is often serious aggression as the younger male attempts to usurp the older male. Such male pairings therefore require very careful management.

Where linked enclosures are used, care should be taken to monitor female-female aggression when the male is out of sight in the other part of the enclosure.

The age of removal of young macaques from their mothers is an important consideration for the breeding female, future breeders and stock animals. The young should not normally be separated from their mothers earlier than 10 months of age, preferably 12 months, apart from infants which are unable to be reared by their mother, for example due to poor lactation, injury or illness. Hand rearing should be avoided wherever possible. To avoid major behavioural disturbances, hand-reared animals should be re-integrated with other compatible animals as soon as possible. Separation before six months can cause distress and may lead to persistent behavioural and physiological abnormalities. This may therefore constitute a regulated procedure.

Multiple feeding and watering stations are required in pens to prevent undue competition.

Provision should be made for capturing animals when required for veterinary or husbandry reasons.

In certain climates, it may be possible to hold breeding and stock animals in entirely outdoor enclosures if adequate shelter from climatic extremes is provided.



3.3.2 Enrichment

These animals, having advanced cognitive capabilities, require a suitably complex environment.³⁶ A solid floor, which can be enriched by providing a non-toxic substrate, will allow for the concealment of scattered food items and encourage foraging. The enclosures should normally include vertical and diagonal structures for climbing, facilitating the use of the whole volume of the enclosure. It is advisable to ensure that shelves and perches are not placed one above the other. A space is recommended between the shelf and enclosure wall to allow for the animal to suspend its tail freely.

Ladders, perches and toys to chew are all of value. In larger enclosures, a water tank (which is easily emptied) is particularly valuable for *M. Fascicularis*, but *M. mulatta* will also use it. Where water tanks are provided it is good practice to ensure there are suitable escape routes from the tank, particularly for young animals which may be at risk of tiring quickly. Food can be dropped into the water for the long-tailed macaque and it will dive to retrieve it. Devices to encourage foraging (ranging from food scattered in the substrate to puzzle-feeders) have proved effective. Suitable food material can be placed on the mesh roof to encourage the animals to access it from the top of the enclosure. As novelty is important, it is strongly recommended that toys are provided and exchanged frequently.

3.3.3 Dimensions and flooring

For the animals to feel secure, it is recommended that the design and interior dimensions of the enclosure at least allow them to climb above human eye level.³⁷

Housing the animals in larger groups and in enclosures larger than the minimum permitted dimensions should be encouraged. Animals should ideally be housed in indoor enclosures of sufficient size to permit all animals to be provided with at least the minimum space allowances.

As these animals spend considerable periods on the ground, the use of solid floored pens is recommended. Where grid floors are used, the animals should have access to a suitable solid resting and foraging area.

3.3.4 Feeding

See Part 1: Advice applicable to all Non-Human Primates.

3.3.5 Watering

See Part 1: Advice applicable to all Non-Human Primates.

3.3.6 Substrate, litter, bedding and nesting material

See Part 1: Advice applicable to all Non-Human Primates.

3.3.7 Cleaning

See Part 1: Advice applicable to all Non-Human Primates.

3.3.8 Handling

Macaques can be trained to cooperate in simple routine procedures such as injections or blood sampling and to come to an accessible part of the enclosure.

3.3.9 Humane killing

See Part 1: Advice applicable to all Non-Human Primates.

3.3.10 Records

See Part 1: Advice applicable to all Non-Human Primates.

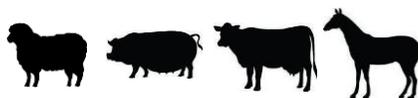
³⁶ In order to meet the requirements of the 'CoP' Standards applicable to non-human primates

³⁷ In order to meet the requirements of the 'CoP' Standards applicable to non-human primates



4.3.11 Identification

See Part 1: Advice applicable to all Non-Human Primates.



Chapter 8: Farm animals and equines

This chapter must be read in conjunction with *the 'CoP', the Introduction and Chapter 1: Advice applicable to all animals*.

1 Advice applicable to all farm animals except equines

In addition to the mandatory requirements covered in the Code of Practice, in the case of farm animals, compliance with legislation relating to the identification, welfare, keeping, breeding, transport and slaughter of these species is also necessary.

1.1 Environmental conditions

Under natural conditions farm animals are exposed to, and will tolerate, a wide range of temperatures, although there is some variation in the degree of tolerance between species and breeds. They will seek shelter against driving rain and strong wind, and protection from intense sun. Where they are kept in enclosures exposed to outdoor conditions, suitable shelter and shade and a reasonably dry lying area should be provided, in order to meet the mandatory requirement that animals shall not be restricted to outdoor areas under climatic conditions which may cause them distress. Shelters should be carefully positioned taking local climatic conditions into consideration. Sufficient shelter should be provided to protect all animals at the same time from adverse climatic conditions. On grazing land, natural features may in themselves provide suitable shelter.

Animals held outdoors or in buildings with natural ventilation will be exposed to ambient environmental conditions. Animals should not be restricted to such areas under climatic conditions which may cause the animals distress.³⁸

Environmental parameters, in particular temperature and humidity, are strictly interrelated and should not be considered in isolation.

1.1.1 Ventilation

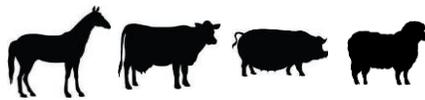
All farm animals are susceptible to respiratory problems under certain climatic and housing conditions. In the absence of mechanical ventilation, as is the case in a significant number of farm animal buildings, it is important to ensure that suitable air quality is provided by natural ventilation. Ventilation systems should ideally be designed to avoid or at least minimise draughts. Ventilation systems should be designed with due consideration for the minimisation of dust levels in the air from feed and bedding, along with ammonia levels and other aerial contaminants.

1.1.2 Temperature

The thermoneutral zones of farm species vary considerably, depending on the conditions to which the animals are acclimatised. Some farm animals living outdoors can, given time, develop a thick layer of hair/wool during the winter months to help them to tolerate low temperatures. They may acclimatise to lower temperatures indoors even without the growth of winter coats, provided the relative humidity is low, draughts are avoided and they have a lying area with sufficient dry bedding material. In indoor enclosures it is therefore important to avoid wide fluctuations and sudden changes in temperature, particularly when moving animals between indoor and outdoor accommodation. As farm animals may suffer from heat stress, during periods of high temperature it is important to ensure that appropriate measures, for example the appropriate shearing of sheep and provision of shaded lying areas, are in place to avoid welfare problems if forced mechanical ventilation is not available or not adequate.

Appropriate temperature ranges are dependent on a number of factors including, for example, breed, age, caloric intake, weight, stage of lactation and type of environment.

³⁸ 'CoP' Standards applicable to all animals



1.1.3 Humidity

Under natural conditions, farm animals are exposed to, and tolerate well, a wide range of relative humidity. In controlled environments it is advisable to avoid extremes and sudden wide fluctuations of humidity, as both high and low humidity can predispose animals to disease.

In indoor enclosures, buildings should be designed with due consideration to providing sufficient ventilation to prevent prolonged periods of high humidity, as this may cause excessive dampness in the animal enclosures, predisposing the animals to respiratory disease, foot-rot and other infectious conditions.

1.1.4 Lighting

Farm species have evolved to live in different conditions; for example ruminants graze and rest during daylight in open grassland, whereas pigs show crepuscular activity in woodland areas. Provision of adequate light is important for all farm animal species, and natural light is preferred where possible. Where this is not provided, the light part of the photoperiod is recommended to be within a range of 8 to 12 hours daily, or should reproduce natural light cycles. A controlled photoperiod may be needed for breeding and for some experimental procedures.

Where windows are provided, breakable glass should be screened using a protective physical barrier or be situated out of reach of the animals, as it is considered to be a material potentially detrimental to the health of the animals.³⁹

1.1.5 Noise

Unavoidable background noise from, for example, ventilation equipment, should be minimised, and sudden noises should be avoided where these may adversely affect animal welfare. Handling and restraint facilities should be designed and operated to minimise noise during use. However, habituating animals to normal background agricultural noise (e.g. tractors) may be beneficial to the animal – attempting to prevent all noise may be counterproductive and result in overly noise-sensitive animals.

1.1.6 Alarm systems

See Chapter 1: Advice applicable to all animals.

1.2 Health

1.2.1 Disease control

As farm animals are often sourced from commercial farms, it is important that measures are taken to ensure that animals of a suitable health status are obtained. Mixing animals from different sources is a particular risk.

Preventive medicine programmes should be developed on the basis of veterinary advice for all farm species, and appropriate vaccination regimes adopted as necessary. Foot care management, parasite control measures and nutritional management are essential parts of all farm-animal health programmes. Regular dental examinations and respiratory disease preventive measures are of particular importance in equine programmes.⁴⁰

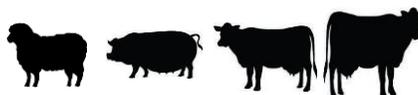
To promote health, particularly in growing or lactating animals, consideration should be given to the use of production indices and condition scoring. Care is needed to ensure that any substrate provided does not introduce or promote growth of infectious agents or parasites.

1.2.2 Behavioural abnormalities

Behavioural abnormalities such as tail, ear or flank chewing or biting, wool pulling, navel sucking, weaving and crib biting can occur as a consequence of poor husbandry or environmental conditions,

³⁹ 'CoP' Standards applicable to all animals

⁴⁰ These are considered necessary in order to fulfil the requirements of the 'CoP' Chapter 1 Standards applicable to all animals



social isolation, or from boredom due to long periods of inactivity. If such abnormalities occur, measures should be taken immediately to rectify these deficiencies including, for example, a review of environmental factors and management practices.⁴¹

1.2.3 Husbandry

Disbudding, dehorning of animals, castration, nose ringing, teeth clipping and tail docking should not be done unless justified on welfare or veterinary grounds or unless undertaken as a regulated procedure as part of a licensed programme of work. Such techniques may be carried out as non-experimental agricultural practices, non-experimental clinical veterinary practices or as recognised animal husbandry outside the controls of ASPA, and if so they must be undertaken in accordance with all relevant animal welfare legislation and/or the Veterinary Surgeons Act as appropriate. The highest standards of practice should be adopted, including ensuring that they are carried out at the optimal life stage and using appropriate analgesia and anaesthesia.

1.2.4 Neonatal care

High standards of stockmanship and care are necessary for successful rearing of farm animals during the neonatal period.

Suitable accommodation, with a dry clean area, should be provided for peri-parturient and neonatal animals.⁴² Consideration should be given to the design of facilities to facilitate observation. High hygiene standards should be maintained, as young animals are particularly susceptible to infections.⁴³ Where mothers have lambs or kids at foot, it is advisable to review the enclosure area, particularly where the enclosure size was minimal prior to parturition (birthing).

All neonates should receive adequate amounts of colostrum as soon as possible after birth, and preferably within four hours. Adequate supplies of colostrum should, where possible, be available for use in emergencies. Suitable feeding practices should be in place to allow normal growth and development, with access to roughage provided to ruminants from two weeks of age.⁴⁴

As neonatal animals have poorer thermoregulatory control than adults, particular care is needed to ensure that suitable temperatures are provided and maintained. A supplementary local heat source may be required, although care is needed to avoid the risk of injury, such as burns, and accidental fires.

To reduce the risk of mismothering or rejection, it is important that a strong maternal bond is allowed to develop during the first few days of life. During this period it is important to minimise handling or management procedures that may disrupt this relationship or prevent the young animals accessing sufficient amounts of colostrum or milk.

Weaning strategies should be given due consideration to minimise stress in the mother and offspring. Weaning into groups of animals of similar ages facilitates the development of compatible and stable social structures.

Naturally reared pigs and mini-pigs should not be weaned before 4 weeks of age, lambs, kids and beef calves before 6 weeks of age and equines before 20 weeks of age, unless there is justification on veterinary or welfare grounds. Early weaning from the dam may be a regulated procedure. In such circumstances the Home Office should be consulted regarding whether Project Licence authority is required. Proper consideration should be given to the targeting of additional attention and means to the welfare and care of animals weaned early from the dam.

⁴¹ This is considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals

⁴² This is considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals

⁴³ These high standards are considered to be "suitable" for the purposes of the requirements of the 'CoP' Standards applicable to all animals

⁴⁴ This is considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals



For animals which are artificially reared, commonly dairy calves, appropriate feeding regimes should be provided to satisfy nutritional requirements, and in the case of ruminants, to promote normal rumen development.⁴⁵

1.3 Housing, enrichment and care

1.3.1 Housing

Farm animals should be housed in socially harmonious groups within the animal enclosure, and husbandry practices should be designed to minimise social disruption, unless the scientific procedures or welfare requirements make this impossible.

When kept in groups, a defined hierarchy may be quickly established. Some aggressive interaction may be encountered during initial grouping while relative rankings in the social hierarchy are established. It is important to monitor the condition and well-being of those animals at the bottom of the social hierarchy.

Special care is needed to minimise aggression and potential injury when grouping, re-grouping, or introducing an unfamiliar animal to a group. In all cases, due consideration should be given to grouping the animals according to size and age, and it is advisable to monitor for social compatibility on an ongoing basis. Separation from a group and the single housing of farm animals for even short periods can be a significant stress factor. Therefore, single housing of farm animals should only occur on animal health or welfare grounds, unless it is permitted by Project Licence authority.⁴⁶ Examples of exceptions where animals may prefer to be housed singly are females about to give birth, and adult boars, which can be solitary under natural conditions.

Accommodation specifications in the CoP and described below are provided for animals without horns (i.e. polled). The mixing of horned and polled cattle should normally be avoided. Where cattle, sheep or goats are horned, additional consideration must be given to the size of enclosure, escape routes for other animals and staff, and feeding and trough dimensions and location, in order to meet the minimum requirements set out in the CoP.

Single housing is covered in more detail in the CoP Chapter 1. Factors to be taken into consideration include the nature of the individual animals, their likely reaction to separation from the group and the need for and duration of a habituation period.

All enclosures should be designed and maintained to ensure that animals cannot be trapped or injured, for example in partitions or under feed troughs.⁴⁷

Animals should not be tethered, unless justified on scientific or veterinary grounds, in which case this should be for the minimum time period necessary and under appropriate Project Licence authority or under the care of a veterinary surgeon.

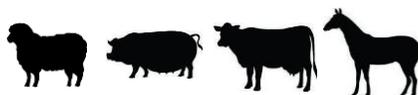
1.3.2 Enrichment

As a stimulating environment is an important contributing factor to farm animal welfare, environmental enrichment should be provided to prevent boredom and stereotypic behaviour. All farm animal species naturally spend a large amount of time each day grazing, browsing or rooting for food, and in social interaction. Careful consideration should be given to providing suitable opportunities to meet these behaviours, preferably by access to pasture, or if this is not possible, by providing hay or straw. If there are compelling reasons why this is not possible, manipulable objects relevant to the species (such as chains or balls for pigs) may be suitable alternatives.

⁴⁵ This is considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals

⁴⁶ See the 'CoP' Introduction: Specifying deviations from CoP standards.

⁴⁷ This is considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals,



Enrichment materials and devices should be changed at regular intervals since animals, in particular pigs, tend to lose interest in materials to which they have become accustomed. Sufficient enrichment devices should be provided to minimise aggressive behaviour.⁴⁸

1.3.3 Dimensions and flooring

Appropriate design of farm-animal enclosures is essential to ensure that suitable space is available within the enclosure to allow the animals to carry out a range of normal behaviours. Floor type, drainage, provision of bedding for comfort and manipulation and the social circumstances (group size and stability) will all impact on the space requirements for the animals.

Sufficient space should be provided for each animal to stand up, lie comfortably, stretch and groom themselves, with access to a communal lying area and adequate room for feeding. The lying area should allow all animals to lie in lateral recumbency simultaneously, bearing in mind that whilst some farm animals, for example pigs, generally prefer to lie in physical contact with other conspecifics, others prefer a degree of spatial separation. Under conditions of high temperatures, where animals need to lie with complete spatial separation to facilitate heat loss, a greater lying area should be allowed.⁴⁹

The lying area should be provided with bedding to enhance comfort and reduce the incidence of pressure lesions. Where absence of bedding is necessary for experimental reasons, the floor should be designed and insulated to improve physical and, unless a suitable controlled environment is provided, thermal comfort.⁵⁰

Due consideration should be given to natural rearing and mounting behaviour with regards to enclosure height.

Enclosure flooring materials should be non-injurious and provide adequate grip for unconstrained locomotion and posture change. Appropriate consideration should be given to the maintenance and replacement of flooring, as surface damage will cause injuries to develop over time.

1.3.4 Feeding

The diet should provide adequate nutrients to support good body condition of each animal, given the environmental conditions under which animals are kept. Additional energy will be needed to support pregnancy, lactation and growth, and should be tailored to the needs of the animals (for example, high genetic merit dairy cattle). Vitamin and mineral levels in the diet should also be considered, for example to avoid copper toxicity in sheep or the formation of urinary calculi in male sheep, and where necessary, mineral licks should be provided.

When grazed grass is used as forage, there should be due consideration to the control of stocking densities to ensure adequate supplies are available to meet the nutritional requirements of all the animals. Where grass supply is limited, provision of additional feed in the field should be considered.

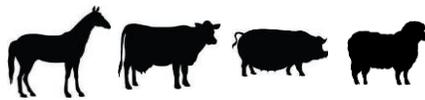
For ruminants and horses, it is advisable to avoid sudden changes in diet and to introduce new items gradually, especially where high-energy feeds are introduced, or during periods of high metabolic demand, for example around parturition. Sufficient roughage should be provided to meet the nutritional needs of the animal.

Forage forms a significant component of the diets of farm animals. Since the amount of forage needed may preclude the use of bags for storage, it is advisable to store forage items, including hay, straw, silage and root crops, in a way that minimises deterioration in quality and the risk of contamination. Due consideration should be given to a pest-control strategy in areas where forage and concentrates are stored.

⁴⁸ This is considered necessary in order to fulfil the requirements of the 'CoP' Chapter 1 *Standards applicable to all animals*

⁴⁹ *These recommendations are considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals*

⁵⁰ *These recommendations are considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals*



When grass is cut for feeding housed animals (for example, zero-grazing), it is advisable that this is done frequently, as cut grass heats up when stored and becomes unpalatable.

1.3.5 Watering

Animals should have access at all times to fresh uncontaminated water, which should be readily accessible to all individuals within the social group. The number of drinking points or trough length should be sufficient to allow access to water for all individuals within the social group. Flow rates should meet the demands of the individual animal as these will vary depending on the feed, physiological status and ambient temperature, for example, lactating animals have much higher water demands than stock animals.

1.3.6 Substrate, litter, bedding and nesting material

See Chapter 1: Advice applicable to all animals.

1.3.7 Cleaning

See Chapter 1: Advice applicable to all animals.

1.3.8 Handling

If handling and restraint facilities are required, these should be of robust construction and safe for animals and operators. In particular, a non-slip floor may often be required in order to ensure animals do not hurt themselves.

Handling and restraint facilities can take the form of basic equipment provided within the animal enclosure, or more complex, dedicated facilities serving the needs of the whole establishment. Handling and restraint facilities can be provided in the enclosure area, but care should be taken to ensure that these do not compromise space allowances or create a potentially hazardous physical obstruction in the enclosure.

The dedicated facilities should, where possible, incorporate races and pens for separating animals; footbaths; special facilities for some species such as shearing pens for sheep; and an area to allow animals to recover after treatments. Ideally these facilities should be protected from prevailing weather conditions for the comfort of both animals and operators.

It is good practice to handle animals quietly and firmly and not rush them along races and passageways. Due consideration should be given to the design of these, taking account of the natural behaviour of the animals, to facilitate ease of movement and minimise the risk of injury. Immobilisation devices should not cause injury or unnecessary distress. Aversive stimuli that cause pain and/or tissue damage, physical or electrical, should not be used.⁵¹

Consideration should be given to designing passages and gates to have sufficient width to permit two animals to pass freely, whereas races will normally be only wide enough to permit one-way movement.

Regular handling will allow habituation of animals to human contact. Where frequent handling is required, fear and distress can be minimised by the use of training and positive rewards.

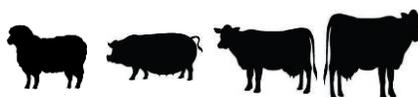
Animals should not normally be closely confined except for the duration of any examination, treatment or sampling, whilst accommodation is being cleaned, while awaiting milking, or loading for transport.

1.3.9 Humane killing

All systems for the humane killing of farm animals should be designed and operated to ensure that animals are not caused unnecessary distress. Careful handling by experienced staff, with minimum disruption to normal practices, will minimise distress to the animals before they are humanely killed.

Killing should not normally be performed in areas where other animals are present, unless in the case of euthanasia of a badly injured animal, where additional suffering may be caused by moving the animal and it is not otherwise possible to separate the animal.

⁵¹ This is considered necessary in order to comply with Condition 1 of the Establishment Licence.



1.3.10 Records

See Chapter 1: Advice applicable to all animals.

1.3.11 Identification

Animals should be individually identified by the appropriate use of transponders, ear tags, plastic neck collars and/or rumen boluses. Freeze branding and tattooing may be less suitable. Hot branding should not be used unless authorised by a Project Licence. Animals should be identified at as young an age as is practicable.

Consideration should be given to planning the application of identification devices so that it can be performed by properly trained personnel and at times when the procedure is likely to have minimal adverse effects on the animal. Normal practice is for tagged or tattooed ears to be checked regularly for signs of infection and lost tags replaced using the original tag hole where possible.

If electronic identification devices are used, care should be taken to ensure they are of the correct size and specification for the animal and are checked regularly for function and the absence of any adverse reactions, for example, injection site reactions and rubbing or pharyngeal trauma as a result of improper bolus administration.

2 Additional advice applicable to cattle

Cattle (*Bos taurus* and *Bos indicus*) are social animals forming hierarchies based on dominance relationships among herd members. They will frequently develop affinity relationships with conspecifics. As ruminants, cattle spend much of the day foraging, followed by long rest periods. Cattle are normally – but not always – docile and are often easily habituated to human contact.

2.1 Environmental conditions

2.1.1 Ventilation

See Part 1: Advice applicable to all farm animals except equines.

2.1.2 Temperature

See Part 1: Advice applicable to all farm animals except equines.

2.1.3 Humidity

See Part 1: Advice applicable to all farm animals except equines.

2.1.4 Lighting

See Part 1: Advice applicable to all farm animals except equines.

2.1.5 Noise

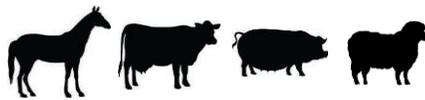
See Part 1: Advice applicable to all farm animals except equines.

2.1.6 Alarm systems

See Part 1: Advice applicable to all farm animals except equines.

2.2 Health

See Part 1: Advice applicable to all farm animals except equines.



2.3 Housing, enrichment and care

2.3.1 Housing

In most circumstances horned and polled animals should not be mixed. Where horned cattle are housed together in groups, more space will be required. It is advisable that the width of the pen is no less than the length of the animal from the nose to the root of the tail.

2.3.2 Enrichment

See Part 1: Advice applicable to all farm animals except equines.

2.3.3 Dimensions and flooring

Where cattle are housed indoors, a bedded area sufficient to allow all of the animals to lie simultaneously should be provided.⁵² Where cubicles are not provided, this area will normally be approximately 70% of the minimum floor area (see tables in the CoP, Chapter 8). The remainder of the enclosure can be non-bedded for feeding and exercise.

If individual open-ended cubicles are provided as the bedded area, this area may be reduced in size, but it is advisable that the total number of cubicles exceeds animal numbers by 5% (or 10% for dairy cows) to reduce competition and permit all animals to lie simultaneously. The design of cubicles is critical to their comfort, and specialist advice should be sought before installation. It should include consideration of the body size of the animal, a surface sufficiently cushioned to prevent injury, adequate stall drainage, correctly positioned stall dividers and head rails, lateral and vertical freedom for head movement and adequate lunging space. The height of the rear step should prevent dung entering the cubicle during cleaning, but not be of such a height that it causes damage to the feet during entry and exit. The remainder of the enclosure can be non-bedded for feeding and exercise.

Correct cubicle length is primarily determined by the weight of the animals, and it is important to ensure the appropriate drainage of excreta. Cubicle width will vary, depending on the type of division used, but should be sufficient to allow the animals to lie comfortably without undue pressure being exerted by the divisions on vulnerable parts of the body. Specialist advice should be sought on the design and installation of cubicles.

2.3.4 Feeding

The trough space provided should ideally be sufficient to allow all animals to feed at the same time, unless the diet is available *ad libitum*. Horned cattle require more trough space than polled animals, and allowance should be made for this.⁵³

2.3.5 Watering⁵⁴

Water troughs: there should be sufficient linear trough space to allow 10% of the animals to drink at one time. This equates to a minimum of 0.3 metres per ten adult cattle. Lactating dairy cows require 50% more space.

Water bowls: a minimum of two water bowls should be provided when cattle are group housed. For groups of over 20 cattle, at least one drinking bowl for 10 animals should be provided. Water bowls are not suitable for lactating cattle, which have higher rates of water consumption.

2.3.6 Substrate, litter, bedding and nesting material

See Part 1: Advice applicable to all farm animals except equines.

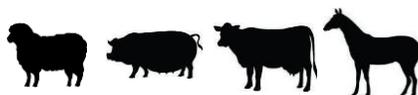
2.3.7 Cleaning

See Part 1: Advice applicable to all farm animals except equines.

⁵² In order to fulfil the requirements of the 'CoP' Standards applicable to all animals

⁵³ In order to fulfil the requirements of the 'CoP' Standards applicable to all animals

⁵⁴ These recommendations are considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals



2.3.8 Handling

Where animals are milked by machine, it is advisable to maintain equipment to a high standard to prevent diseases such as mastitis.

Horned cattle may present a danger to personnel in confined spaces. Under these circumstances, it may be necessary to consider dehorning. Wherever possible, this should be carried out on calves under the age of eight weeks.

2.3.9 Humane killing

See Part 1: Advice applicable to all farm animals except equines.

2.3.10 Records

See Part 1: Advice applicable to all farm animals except equines.

2.3.11 Identification

See Part 1: Advice applicable to all farm animals except equines.

3 Additional advice applicable to sheep and goats

Sheep (*Ovis aries*) are grazing animals which will thrive in a wide range of climatic conditions. Some breeds are particularly well adapted to certain conditions due to, for example, fleece characteristics.

Under natural or farming conditions, sheep are very social, spending all their lives close to other members of the flock whom they recognise individually. As a species, they are therefore particularly disturbed by social isolation, a factor which should be taken into account when designing and operating animal accommodation. However, in terms of social cohesion there are recognisable variations between breeds as, for example, hill sheep tend not to flock closely together when left undisturbed.

Goats (*Capra hircus*) are a naturally inquisitive species and generally interact well with other animal species and humans. Like sheep, goats live in social groups and are disturbed by social isolation. Goats obtain their food by browsing more than by grazing and are best adapted to dry, firm ground. Their ability to climb is considerable and this facilitates their browsing. They prefer warm conditions and do not tolerate wet and windy conditions well.

3.1 Environmental conditions

3.1.1 Ventilation

See Part 1: Advice applicable to all farm animals except equines.

3.1.2 Temperature

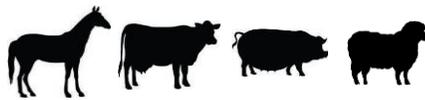
Under extreme conditions, sheep will require access to natural or artificial wind-break shelter and shade, whilst different coat characteristics mean that goats are less tolerant of prolonged rain and should have free access to roofed shelter areas whilst outside.⁵⁵

Consideration should be given to the environmental needs of recently shorn sheep until they accommodate to their new state.

3.1.3 Humidity

See Part 1: Advice applicable to all farm animals except equines.

⁵⁵ These recommendations are considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals



3.1.4 Lighting

See Part 1: Advice applicable to all farm animals except equines.

3.1.5 Noise

See Part 1: Advice applicable to all farm animals except equines.

3.1.6 Alarm systems

See Part 1: Advice applicable to all farm animals except equines.

3.2 Health

It is advisable to shear adult sheep and goats of wool breeds at least once per year, unless this would compromise their welfare.

3.3 Housing, enrichment and care

3.3.1 Housing

Entire adult males from both species can be more solitary than females and young offspring. They may be aggressive, particularly during the breeding season, requiring careful management to reduce the risks of fighting and injury to handlers. Where possible, rams should not normally be singly housed, but care will be needed to prevent injury through fighting. They can often be kept in groups of three or more, according to the breed and time of year.

Horned and polled goats should not normally be housed together.

3.3.2 Enrichment

Sufficient raised areas of appropriate size and quantity to prevent dominant animals impeding access is advisable for goats.

3.3.3 Dimensions and flooring

The entire enclosure should have a solid floor with appropriate bedding provided.⁵⁶

3.3.4 Feeding

See Part 1: Advice applicable to all farm animals except equines.

3.3.5 Watering

In indoor enclosures for sheep and goats at least one drinking point per 20 animals should be provided.⁵⁷

3.3.6 Substrate, litter, bedding and nesting material

See Part 1: Advice applicable to all farm animals except equines.

3.3.7 Cleaning

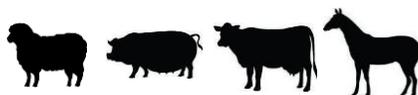
See Part 1: Advice applicable to all farm animals except equines.

3.3.8 Handling

See Part 1: Advice applicable to all farm animals except equines.

⁵⁶ This recommendation is considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals

⁵⁷ This recommendation is considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals



3.3.9 Humane killing

See Part 1: Advice applicable to all farm animals except equines.

3.3.10 Records

See Part 1: Advice applicable to all farm animals except equines.

3.3.11 Identification

In addition to legally required identification, dyeing the fleece or coat using recognised non-toxic agricultural marker products may be used for short-term experiments in short-wool breeds of sheep and in goats.

4 Additional advice applicable to pigs and mini-pigs

The domestic pig (*Sus scrofa*) is descended from the European wild boar. Although subject to intensive selection pressure over many generations for production characteristics of economic importance, domesticated pigs have largely retained the same behavioural repertoire as their ancestors. Under unrestricted conditions, they live in small family groups, show an evening and early morning diurnal rhythm and have strongly developed exploratory behaviour. They are omnivorous and a large part of their active time is spent foraging for food. At birth, sows farrow in social isolation and construct a nest prior to parturition. Weaning is gradual and is completed at about four months of age, and piglets integrate gradually into the social group with little aggression.

Mini-pigs differ from the farm pig in many significant respects. A number of different mini-pig strains have been developed by conventional breeding procedures in order to produce a small pig suitable for research purposes. For the purpose of this document, the mini-pig is defined as a small pig breed for use in experimental and other scientific purposes and with an adult body weight typically not exceeding 60 kg, but can be as high as 150 kg in some strains. Because of this difference in body size at maturity, recommendations for farm pigs cannot always be extrapolated on a simple weight basis. Recommendations in this document apply to both types of pig, with specific requirements of mini-pigs annotated where necessary.

4.1 Environmental conditions

4.1.1 Ventilation

See Part 1: Advice applicable to all farm animals except equines.

4.1.2 Temperature

Pigs and mini-pigs place a high behavioural priority on thermoregulation. Pigs may be kept in a uniform, temperature-controlled environment, in which case the whole room should be maintained within the thermoneutral zone. Alternatively, they may be kept in an enclosure with different microclimates, by providing localised heating or kennelling of the lying area and provision of adequate bedding material.

A temperature gradient within the enclosure is considered beneficial, and ideally pigs should be able to choose their ambient temperature by use of bedding and/or moving to a different area. Pigs provided with optimal temperature and temperature gradients will tend to divide their pen into feeding, sleeping and dunging areas. Outdoor pigs can compensate for lower ambient temperatures provided that adequate shelter, with plentiful dry bedding, and additional food is provided.

Suitable temperature ranges for different categories of pigs are provided by Defra.⁵⁸

Animal size, sexual maturity, the presence or absence of bedding, group housing and the caloric intake of the animal should be taken into account when determining suitable temperature.

⁵⁸ Defra *Code of Recommendations for the Welfare of Livestock: Pigs* (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69369/pb7950-pig-code-030228.pdf accessed 27/5/14).



Mini-pigs and piglets of low body weight are more sensitive to environmental temperature due to their high relative surface area, and will usually require higher temperatures.

Some experimental pigs are occasionally housed singly or in small groups when undergoing scientific procedures or on health or welfare grounds. Extra bedding or higher ambient temperature may be required in these circumstances. Unless permitted by licence authority, pigs should always be group housed to allow them to maintain warmth by huddling.

4.1.3 Humidity

See Part 1: Advice applicable to all farm animals except equines.

4.1.4 Lighting

See Part 1: Advice applicable to all farm animals except equines.

4.1.5 Noise

See Part 1: Advice applicable to all farm animals except equines.

4.1.6 Alarm systems

See Part 1: Advice applicable to all farm animals except equines.

4.2 Health

See Part 1: Advice applicable to all farm animals except equines.

4.3 Housing, enrichment and care

4.3.1 Housing

Pigs should not be tethered at any time, and should not be confined in stalls or crates except for short periods of time necessary for feeding, insemination, veterinary or experimental purposes.⁵⁹ The accommodation for sows and piglets should ideally enable the fulfilment of the special behaviour patterns of the sow before and after parturition, and those of the piglets after birth. Thus, although the use of farrowing crates can improve piglet survival and welfare under some conditions, the close confinement of sows during the perinatal and suckling periods should be limited as far as possible and loose housing systems are considered to provide better welfare.

4.3.2 Enrichment

Pigs show spatial separation of different behaviours such as lying, feeding and excretion. Enclosures should therefore ideally allow for the establishment of separate functional areas by providing either plentiful space or appropriate subdivision of the enclosure area.

Pigs have a high motivation to explore and consideration should be given to providing them with an environment of sufficient complexity to allow expression of this species-specific exploratory behaviour. All pigs should at all times have access to adequate amounts of materials such as straw for investigation and manipulation, including rooting, in order to reduce the risk of behavioural disorders.⁶⁰

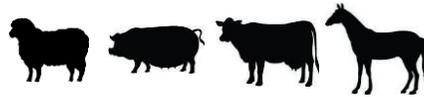
4.3.3 Dimensions and flooring

Where pigs are housed individually or in small groups, greater space allowances per animal are recommended than for those in larger groups.

The most appropriate flooring material will depend on the size and weight of the pigs. To facilitate provision of rooting/nesting substrate, it is desirable to provide a solid floor in the lying area of the pen.

⁵⁹ These recommendations are considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals

⁶⁰ This recommendation is considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals



Slatted floors can be of value in facilitating good hygiene, and when used the slat and void dimensions should be appropriate to the size of the pig to prevent foot injuries.⁶¹

4.3.4 Feeding

Pigs kept for meat production are typically fed *ad libitum* until approximately seven to eight weeks old, after which restricted feeding practices are necessary to avoid obesity. Mini-pigs are prone to become obese on conventional pig diets. Special reduced calorie diets with increased fibre content help to prevent this problem. Where feed restriction is necessary, pigs will show increased foraging motivation which can be expressed as increased activity and aggression, and may precipitate the development of stereotypic oral behaviours. To avoid these problems it is important to modify diets to enhance satiety, for example by providing increased dietary fibre in conjunction with an appropriate foraging substrate such as straw.

With restricted feeding practices pigs are normally fed twice daily, which helps to prevent obesity. Obesity is a particular problem for slow growing, miniature pigs and mature animals. Where feeding is restricted, all individuals within the social group should have access to feed without causing aggression. When animals are housed in larger groups and fed *ad libitum*, trough space can be shared and a lower total space is required.

4.3.5 Watering

As pigs are particularly sensitive to the consequences of water deprivation, in cases where they are group housed, it is recommended that at least two drinking points per unit – or a large bowl allowing more than one pig to drink at the same time – are provided to prevent dominant animals impeding access to the drinking point. To achieve this, the following drinking space allowances are recommended.

Table 3-8-1: Minimum recommended drinking point allowances for pigs and mini-pigs

Drinker type	No. of pigs per drinking point
Nipple or bite drinkers	10
Large bowl drinkers (which allow at least two pigs to drink at the same time)	20

Where pigs housed in larger groups are watered from an open trough, the recommended minimum length of trough perimeter with access to water should be that allowing a single pig unimpeded access. It is the same as for restricted feeding space (See Chapter 8 of this Code of Practice), or 12.5 mm of trough length per pig, whichever is the greater.

It is advisable that water flow rates are adequate to ensure the speed of water provision does not delay drinking.

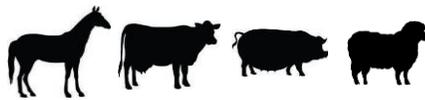
Table 3-8-2: Minimum recommended drinking water flow rate for nipple or bite drinkers for pigs and mini-pigs

Type of pig	Minimum water flow rate (ml/min)
Weaners	500
Growers	700
Dry sows and boars	1000
Lactating sows	1500

4.3.6 Substrate, litter, bedding and nesting material

Bedding contributes to pig welfare in many ways. It enhances physical and thermal comfort (except in hot environmental conditions), can be eaten to provide gut fill and enhance satiety, and provides a substrate for foraging and nest-building behaviours. The extent to which each of these different benefits can be provided will depend on the nature of the bedding, with long straw providing the best

⁶¹ Defra Code of Recommendations for the Welfare of Livestock: Pigs (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69369/pb7950-pig-code-030228.pdf accessed 27/5/14). Suitable minimum dimensions can be found in Council Directive 2008/120/EC "Minimum standards for the protection of pigs".



overall material but alternatives such as chopped straw, sawdust, wood shavings and shredded paper confer some benefits. Bedding should be non-toxic and, where possible, provide structural diversity to stimulate exploratory behaviour. Bedding should be provided for all pigs, unless precluded for experimental reasons, and is particularly important for farrowing sows, which have a strong motivation to perform nest-building behaviour, and for pigs on restricted feeding regimes, which have a strong motivation to express foraging behaviour.⁶²

4.3.7 Cleaning

See Part 1: Advice applicable to all farm animals except equines.

4.3.8 Handling

See Part 1: Advice applicable to all farm animals except equines.

4.3.9 Humane killing

See Part 1: Advice applicable to all farm animals except equines.

4.3.10 Records

See Part 1: Advice applicable to all farm animals except equines.

4.3.11 Identification

See Part 1: Advice applicable to all farm animals except equines.

5 Advice applicable to equines, including horses, ponies, donkeys and mules

Equines evolved as grazers of open grasslands, and domestic horses and ponies (*Equus caballus*) and donkeys (*Equus asinus*) have retained the behavioural repertoire of their ancestors. In the feral or free-ranging state, equines live in herds separated into small family groups or bands typically comprising one stallion, with several mares, foals and yearlings. The social structure develops as a clearly defined hierarchy, and individual animals within a group often form close pair bonds which it is important to recognise and maintain if possible. Mutual body care is a particularly important element in their social life.

Unlike ruminants, equines may graze continuously for many hours and under natural conditions they will spend 14 to 16 hours daily at this activity. Although their natural food is grass, herbs and leaves, they are very selective regarding their choice of grass species and which part of the plant to eat. Their normal daily pattern is to graze, move a few steps and graze again. In this way they exercise as well as feed, and can cover long distances in a 24-hour period.

Ideally, management systems for equines should accommodate their natural behaviour, in particular the need to graze, exercise and socialise. They are flight animals and hence easily startled and this should also be taken into account.

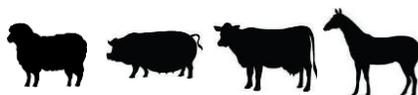
5.1 Environmental conditions

5.1.1 Ventilation

Equines can be susceptible to respiratory problems due to dust, so it is essential that dust is kept to a minimum and ventilation is adequate to provide air circulation without unnecessary draughts. Ventilation slats and windows should be used; however, windows should be constructed of safety glass or Perspex with a safety grille between the equine and the glass.⁶³

⁶²These recommendations are considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals

⁶³These recommendations are considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals



5.1.2 Temperature

Rugs are appropriate for use to regulate temperature, especially if hair has been clipped in cool conditions or to prevent fly irritation during warm weather. Proper consideration should be given to the weight and construction of the rugs so as they are appropriate to the conditions, and to the fit to the equine to prevent rubbing. Rugs should be removed when horses undergo their daily check.⁶⁴

The mane and tail of equines provide natural protection from adverse weather conditions and from flies and ideally should not be removed or cut short. Where manes and tails need to be shortened or tidied it is advisable to achieve this by trimming rather than by pulling, and consideration should be given to providing additional fly protection if necessary.

5.1.3 Humidity

See Chapter 1: Advice applicable to all animals.

5.1.4 Lighting

Sufficient light is essential for the inspection and safe handling of equines. All lighting should be sufficiently high or away from the equine so that the animal cannot injure itself on the fitting, or it should be constructed with a safety fitting. All cabling should be away from the equine and secured to the ceiling and walls to ensure it is not detrimental to the health of the animal.⁶⁵

5.1.5 Noise

See Chapter 1: Advice applicable to all animals.

5.1.6 Alarm systems

See Chapter 1: Advice applicable to all animals.

5.2 Health

Horses should be inspected a minimum of once a day if on pasture and ideally twice a day if housed.

5.3 Housing, enrichment and care

5.3.1 Housing

Some equines such as entire stallions, late-term mares and mares with foals at foot may require individual housing, but should not be totally isolated from others.

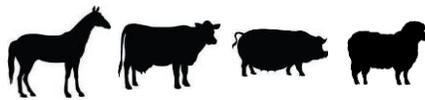
Ideally, equines should be kept at pasture or have access to pasture for at least six hours a day. Where equines are kept with minimal or no access to grazing then additional roughage should be provided to extend the time spent feeding and reduce boredom.

Social compatibility forms an essential part of equine group structure. Care should be taken to select groups that are compatible and any aggressive individuals should be segregated. When establishing a new group or adding a new individual to an established group, stress and fighting can be minimised by increasing the space allowance for the group or penning individuals within the group area to allow social contact to form prior to full introduction, and the impact reduced by removing any metal shoes.

Monitoring should be adequate to ensure that incidents of bullying within equine groups are identified, and care should be taken to ensure that all animals are obtaining sufficient access to feed and water. Interventions to supply additional support or remove individuals from the group should be undertaken as necessary.

⁶⁴ This recommendation is considered necessary in order to fulfil the requirements of Standard Condition 4 (5) of the Establishment Licence

⁶⁵ This is considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals



5.3.2 Enrichment

See Chapter 1: Advice applicable to all animals.

5.3.3 Dimensions and flooring

In indoor enclosures, group-housing systems are preferred since these provide opportunities for socialisation and exercise; however, appropriate care should be taken to ensure that all equines have sufficient space to lie down together and have adequate access to roughage, feed and water.

The total space requirement for indoor enclosures will depend on whether animals also have daily access to additional areas for grazing and/or other forms of exercise. Where such additional areas are not provided then consideration should be given to increasing space allowances significantly.

Flooring should be reasonably even, non-slip and drain away from the lying area. Slatted floors are not suitable for equines as they may cause injury to the animals.⁶⁶

5.3.4 Feeding

Incorrect feeding of equines can have very serious welfare implications, causing illnesses such as colic or laminitis.

Since they naturally graze for long periods, they should ideally have constant access to forage in the form of fresh grass, hay, silage or straw. Where they are not given the opportunity to graze, they should be provided with a suitable quantity of long fibre/roughage every day in order to meet their nutritional needs. Where possible, roughage should be fed on the ground or in suitably designed round bale feeders. Due consideration should be given to the design and positioning of hay nets and racks so as to minimise the risk of injury.

If “hard” (concentrate) feed is offered to animals, consideration should be given to the level of work undertaken by the equine and its individual condition score. Where the animals are housed in groups the feeding order should normally, where possible, follow the herd order of dominance. Where possible, individuals should be fed separately. If this is not possible it is advisable to space feeding points at least 2.4 m apart with at least one point per animal. It is advisable to feed concentrates in small amounts frequently and not within 20 minutes of sustained exercise.

5.3.5 Watering

Equines prefer to drink from an open water surface, and this should be provided where possible. If automatic water nipple drinkers are used, animals may require training to use them.

5.3.6 Substrate, litter, bedding and nesting material

Bedding forms part of environmental enrichment and should be dust-free and of an appropriate quality, quantity and depth to protect the equines from injury and provide comfort. Where rubber matting is used on the floor, a small amount of bedding is still required to soak up urine and provide a dry lying area. Bedding should be managed and changed on a regular basis to ensure the quality and comfort of the bedding is maintained.⁶⁷

5.3.7 Cleaning

See Chapter 1: Advice applicable to all animals.

5.3.8 Handling

Consideration should be given to the handling requirements of the equines, both for experimental purposes and veterinary attention, and especially if the animals may be re-homed.

⁶⁶ This recommendation is considered necessary in order to fulfil the requirements of the ‘CoP’ Standards applicable to all animals

⁶⁷ These recommendations are considered necessary in order to fulfil the requirements of the ‘CoP’ Standards applicable to all animals



5.3.9 Humane killing

See Chapter 1: Advice applicable to all animals.

5.3.10 Records

See Chapter 1: Advice applicable to all animals.

5.3.11 Identification

It is a requirement of the Horse Passports Regulations 2004 that all equines are identified by an Equine Passport within six months of birth, or by the 31 December of the year of birth, whichever is the longer. For equines born after the 1 January 2008 they additionally require microchipping, within the same period, for identification. The transponder number must be registered on the Equine Passport. The Equine Passport must move with the animal if it is transferred to a new owner or keeper, and the Passport Issuing Organisation must be informed, within 28 days of the transfer, of the new owner or keeper's details. It is advisable to microchip all equines at the establishment for identification purposes, not just those born after 1 January 2008.

For immediate visual identification the coat colour and markings may be sufficient. Numbered head-collars and hanging tags for halters have also been used. Freeze-branding is not desirable, and ear tags and tattooing are not suitable for use in equines.



Chapter 9: Birds

This chapter must be read in conjunction with the *CoP, the Introduction and Chapter 1: Advice applicable to all animals*.

1 Advice applicable to all birds

Additional details are provided for the commonly bred and used laboratory species in Part 2 onwards. It is essential that the housing and care of *less* commonly used species not included below pay due regard to their behavioural, physiological and social requirements. Housing, husbandry and care protocols for such species should be researched by the persons responsible before birds are obtained or used. Advice on requirements for other species (or if behavioural or breeding problems occur) should be sought from experts and care staff to ensure that any particular species needs are adequately addressed.

1.1 Environmental conditions

1.1.1 Ventilation

Air change rates and airflow management should ensure that individuals do not become chilled as many species are especially susceptible to draughts.

1.1.2 Temperature

Where appropriate, birds should be provided with a range of temperatures so that they can exercise a degree of choice over their thermal environment. All healthy fully feathered quail, pigeon and domestic ducks, geese, fowl and turkeys should typically be housed at temperatures between 15°C and 25°C. It is essential to take account of the interaction between temperature and relative humidity, as some species will suffer from heat stress within this temperature range if relative humidity is too high. For species where there are no published guidelines on temperature and humidity, the climate experienced in the wild throughout the year should be replicated as closely as possible. Higher room temperatures than those indicated or a localised source of supplementary heat such as a brooder lamp may be required for sick or juvenile birds (see table 3-9-1 below). Where birds are kept in outdoor aviaries, care should be taken that temperature ranges are appropriate to the species, and that adequate shelter, heat sources and nesting materials are available to every bird.

Table 3-9-1: Recommendations for room temperature and relative humidity for domestic fowl and turkeys

Age (days)	Under lamp (°C)	Ambient temperature in room (°C)	Relative humidity (%)
Up to 1	35	25-30	60-80
1-7	32	22-27	60-80
7-14	29	19-25	40-80
14-21	26	18-25	40-80
21-28	24	18-25	40-80
28-35	-	18-25	40-80
Over 35	-	15-25	40-80

Table 3-9-2: Recommendations for temperature for other birds

Species	Under lamp (°C)	Ambient temperature in room (°C)
Quail – adults	-	16-23
Quail – hatched chicks	35-37, reducing by approx. 0.5 °C per day to reach adult temp range at 4 weeks old	-
Small birds	-	19-23
Pigeon	-	15-24
Ducks	-	12-24



The chicks' behaviour should be used as a guide when setting brooder lamp temperature. If thermally comfortable, chicks of all species will be evenly spaced in the enclosure and making a moderate amount of noise; quiet chicks may be too hot and chicks making noisy distress calls may be too cold.

1.1.3 Humidity

For healthy, adult, domestic birds relative humidity within the range of 40 to 80% is typically appropriate.

1.1.4 Lighting

Light quality and quantity are critically important for some species at certain times of the year for normal physiological functioning. Appropriate light and dark regimes for each species, life stage and time of year should be defined before animals are acquired.

It is recommended that lights are not abruptly switched off or on, but are dimmed and raised in a gradual fashion. This is especially important when housing birds capable of flight. Dim night-lights may facilitate movement at night for heavy-bodied poultry strains. Where provided, care should be taken to ensure that circadian rhythms are not disrupted.

1.1.5 Noise

Some birds, for example the pigeon, are considered to be able to hear very low frequency sounds. Although infrasound (sound below 16 Hz) is unlikely to cause distress, it is considered good practice to house birds away from any equipment that emits low frequency vibrations whenever possible.

1.1.6 Alarm systems

See Chapter 1: Advice applicable to all animals.

1.2 Health

Captive-bred birds should be used wherever possible.⁶⁸ Wild birds may present special problems in terms of their behaviour and health when in a research facility. A period of 28 days' quarantine is recommended for wild-caught birds where possible. During this time the birds can become adapted to the research conditions and their health monitored prior to experimental work commencing. It is recommended that the nature of the monitoring is agreed with a veterinary surgeon and may consist of faecal sampling and examination for the presence of parasites and bacteria, including potential zoonoses such as those caused by *Salmonellae* and *Campylobacter*. During this period the veterinary surgeon may advise that birds are treated for the presence of endo- and ectoparasites.

1.3 Housing, enrichment and care

Many birds will benefit from housing that allows them to go outdoors and the feasibility of this should be evaluated with respect to the potential to cause distress or to conflict with experimental aims. It is strongly recommended that some form of cover such as shrubs is always provided outdoors to encourage birds to use all the available area.

Priority should be given to providing an environment which prevents abnormal behaviours – commonly inappropriate pecking behaviour. This can be divided into aggressive pecking, feather pecking (where individuals either peck at other birds' feathers or pluck and pull at their own) and pecking at the skin of other birds, which can cause serious suffering and mortality if unchecked. The cause of inappropriate pecking is not always clear, but it is often possible to avoid outbreaks by rearing chicks with access to substrate that enables them to forage and peck appropriately. Chicks of all species should therefore be housed on solid floors with litter.⁶⁹

Prevention is especially important because fowl are attracted to damaged feathers, and the presence of a few feather-pecked birds may therefore lead to the rapid spread of injurious pecking. There

⁶⁸ Note also that birds of the species *Coturnix coturnix* (common quail) are listed in schedule 2 of ASPA and therefore must have been bred for use in procedures unless otherwise authorised in a Project Licence. For more information please 'see the Guidance on the Operation of the Animals (Scientific Procedures) Act 1986'.

⁶⁹ In order to meet the requirements of the 'CoP' Standards applicable to all animals



are a number of measures that can be employed to avoid outbreaks of injurious pecking wherever possible and to reduce or prevent this behaviour should it occur. These include providing alternative pecking substrates such as foraging substrate, bunches of string, pecking blocks or straw; providing visual barriers; periodically or temporarily lowering the light intensity or using red light; and using light sources that emit UV rays. Anti-pecking sprays are commercially available and can be used to reduce the incidence of injurious pecking in the short term, but it will still be necessary to address the underlying causes of the behaviour. Some strains of domestic bird have been selectively bred so that inappropriate pecking is reduced and such strains should be used wherever possible. Methods which cause pain or distress, such as very low lighting (i.e. below 20 lux) for prolonged periods, or physical modifications such as beak trimming, are considered to cross the threshold for regulation⁷⁰ and should therefore not be used unless scientifically justified. Such methods would require authorisation in the Project Licence.

Birds housed in a poor-quality environment that does not permit them to forage, exercise or interact with conspecifics will experience chronic distress that may be indicated by stereotypic behaviour, for example self-mutilation, feather pecking, and pacing. Such behaviour may be indicative of serious welfare problems and should lead to an immediate review of housing, husbandry and care.

1.3.1 Housing

Many species of birds are highly social and should be kept in stable groups wherever possible, unless the scientific procedures or welfare requirements make this impossible or this is in conflict with the species' natural history.

Single housing of birds for even short periods can be a significant stress factor. Therefore, single housing should only occur on animal health or welfare grounds, unless it is permitted by Project Licence authority.⁷¹ Most species of bird are social for at least part of the year and highly sensitive to family relationships, so the formation of appropriate, stable, harmonious groups should be given a high priority, taking into account the natural history of the species. As there are significant species variations it is advisable to know the optimal composition of groups, and at what stage in the birds' lives these should be created before groups are formed and procedures are undertaken.

1.3.2 Enrichment

A stimulating environment is a very important contributor to good bird welfare. Perches, dust and water baths, suitable nest sites and nesting material, pecking objects and substrate for foraging should be provided for species and individuals that will benefit from them unless there is compelling scientific or veterinary justification for withholding such items, with appropriate authorisation. Birds should be encouraged to use all three dimensions of their housing for foraging, exercise and social interactions including play wherever possible.⁷²

1.3.3 Dimensions and flooring

All birds, especially species that spend a significant proportion of their time walking, such as quail or fowl, should normally be housed on solid floors with substrate rather than on grid floors, which may cause injury to the animals.⁷³ Birds can be prone to foot problems, for example, overgrown claws, faecal accumulation and foot lesions such as foot-pad dermatitis due to standing on wet litter on any type of flooring, and so frequent monitoring of foot condition is always necessary. In practice, it may be necessary to consider a compromise between solid and grid flooring for scientific purposes. In such cases, birds should be provided with solid-floored resting areas occupying at least a third of the enclosure floor. Grid areas should be located under perches if faecal collection is required. To reduce the incidence of foot injuries, slats made of plastic should be used in preference to wire mesh wherever possible. If wire mesh has to be used, it should be of a suitable grid size to adequately support the foot and the wire should have rounded edges and be plastic coated.

⁷⁰ i.e. these methods are considered to be regulated procedures under ASPA.

⁷¹ See the 'CoP' Introduction: Specifying deviations from CoP standards.

⁷² These measures are considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals

⁷³ See the 'CoP' Standards applicable to all animals



It is advisable that the mesh size in grid floors is not greater than 10 x 10 mm for young chicks, and 25 x 25 mm for growers and adults; the wire thickness should be at least 2 mm and the sloping gradient should not exceed 14% (8°).

1.3.4 Feeding

Feeding patterns of wild birds vary widely and consideration should be given to the nature of the food, the way in which it is presented and the times at which it is made available, taking account of the natural history of the species. Diets that will meet the nutritional requirements of each species and promote natural foraging behaviour should be researched and formulated before any animals are obtained. Part of the diet or additional treats may be scattered on the enclosure floor or suspended, according to the species, to encourage natural feeding behaviour wherever appropriate. Dietary enrichment benefits birds, so additions such as fruit, vegetables, seeds or invertebrates should be considered where appropriate even if it is not possible to feed birds on their 'natural' diet. Where new foods are introduced, it is advisable to ensure that the previous diet is available so that birds will not go hungry if they are unwilling to eat new foods. Some species are more adaptable than others and advice should be sought on appropriate dietary regimes.

As some species, particularly granivores, require grit to digest their food, consideration should be given to whether these species should be provided with grit. Birds will select grit of the size they prefer if material of various sizes is provided. The grit provided requires regular renewal. It is also recommended that dietary calcium and phosphorus are provided for birds in an appropriate form and at an appropriate level for each life stage, to prevent nutritional bone disease. Any such requirements should be thoroughly researched and catered for. Food can be supplied in feeders that are either attached to the side of the enclosure or standing on the enclosure floor. Space occupied by floor feeders is not available to the birds and should not be included in calculations of pen area. Wall-mounted feeders do not occupy floor space but should be designed and fitted with care so that birds cannot become trapped underneath them. Chicks of some species (for example, domestic turkeys) may need to be taught to feed and drink in order to avoid dehydration and potential starvation. It is important to ensure that food for all species is clearly visible and provided at several points to help prevent feeding problems.

1.3.5 Watering

Water should be provided through a system suitable to the bird type and age to ensure the bird can drink, for example, via nipple or cup drinkers, or as a continuous drinking channel. There should be sufficient drinkers or an adequate length of channel drinker to prevent dominant birds from monopolising them. It is recommended that one nipple or cup drinker is provided for every three or four birds, with a minimum of two in each enclosure. Supplementary water may also be given as enrichment in birds' feed if appropriate.

1.3.6 Substrate, litter, bedding and nesting material

Suitable substrates for birds are absorbent, unlikely to cause foot lesions and of an appropriate particle size to minimise dust and prevent excessive accumulation on the birds' feet. Suitable substrates include chipped bark, white wood shavings, chopped straw or washed sand, but not sandpaper. It is advisable to maintain litter in a dry, friable condition and for it to be sufficiently deep to dilute and absorb faeces. Other suitable floor coverings include plastic artificial turf or deep pile rubber mats. It is advisable to ensure that suitable pecking substrate such as pieces of straw is scattered over the floor. Some species may benefit from natural substrates in which to probe (e.g. sand, turf) to prevent the need for bill clipping.

It is important to provide hatchlings and juvenile birds with a substrate that they can grip to avoid developmental problems such as splayed legs. Juvenile birds may also be encouraged if necessary, for instance by tapping with the fingers, to peck at the substrate to help prevent subsequent misdirected pecking.

1.3.7 Cleaning

See Chapter 1: Advice applicable to all animals.



1.3.8 Handling

Catching wild birds to use as experimental animals should be avoided unless it is necessary for the purposes of the experiment, and licence authority has been granted.

It is advisable to ensure that suitable equipment for catching and handling is available, for example well-maintained nets in appropriate sizes and darkened nets with padded rims for small birds. If the experimental procedure requires adult birds to be handled regularly, it is recommended from a welfare and experimental perspective to handle chicks frequently during rearing, as this reduces later fear of humans.

1.3.9 Humane killing

The preferred method of killing for juvenile and adult birds is an overdose of anaesthetic using an appropriate agent and route. This is preferable to carbon dioxide inhalation, as carbon dioxide may be aversive. As diving birds and some others, for example, mallard ducks, can slow their heart rates and hold their breath for long periods, care should be taken when killing such species by inhalation to ensure that they do not recover. It is strongly recommended not to attempt to kill ducks, diving birds or very young chicks using carbon dioxide.

The Cash special captive bolt designed for poultry, followed by neck dislocation, is a humane alternative for the killing of poultry.

1.3.10 Records

See Chapter 1: Advice applicable to all animals.

1.3.11 Identification

Non-invasive or minimally invasive methods such as noting physical differences, ringing with either closed or split rings and staining or dyeing the feathers are preferable to more invasive techniques such as electronic tagging or wing tagging. Combinations of coloured leg rings minimise handling for identification, although due regard should be paid to any potential impact of colours on behaviour in some species. When using rings as temporary marking for rapidly growing chicks, regular checking is essential to ensure that the ring is not impeding the growth of the leg. Highly invasive marking methods such as toe-clipping or web-punching cause suffering and may therefore be regulated procedures.

2 Additional advice applicable to chickens (*Gallus gallus domesticus*)

Chickens (domestic fowl, *Gallus gallus domesticus*) retain much of the biology and behaviour of the Jungle fowl from which they were domesticated. Behaviours that are most important to the species are nesting (in females), perching and using litter for foraging, scratching, pecking and dust-bathing. Fowl are social and are preferably housed in groups of around 5 to 20 birds, with fewer males than females in adult groups, for example, a ratio of 1 to 5.

Attempts have been made to select strains of fowl for reduced feather pecking or agonistic behaviour. It is recommended to assess the suitability of appropriate strains of this type, including the feasibility of acquiring them, for each project.

2.1 Environmental conditions

2.1.1 Ventilation

See Part 1: Advice applicable to all birds.

2.1.2 Temperature

See Part 1: Advice applicable to all birds.



2.1.3 Humidity

See Part 1: Advice applicable to all birds.

2.1.4 Lighting

See Part 1: Advice applicable to all birds.

2.1.5 Noise

See Part 1: Advice applicable to all birds.

2.1.6 Alarm systems

See Part 1: Advice applicable to all birds.

2.2 Health

Fowl strains developed for rapid growth rates (broilers) are highly susceptible to lameness and their use should be avoided wherever possible. If broilers are used, it is usually necessary to assess individuals for lameness at least weekly and grow them more slowly than commercial rates, unless a commercial growth rate is essential for the study.

2.3 Housing, enrichment and care

2.3.1 Housing

It is important that laying hens have access to nest boxes from at least 2 weeks before coming into lay and no later than 16 weeks of age. It is recommended that single- or pair-housed birds each have access to a nest box, with a ratio of at least one nest box per two birds for larger groups. It is recommended that nest boxes are enclosed and large enough to allow one hen to turn around.

Ideally, birds should be housed with outdoor access; appropriate cover such as bushes is essential to encourage fowl to go outside.

2.3.2 Enrichment

Fowl should always be provided with the opportunity to perch, peck appropriate substrates, forage and dust-bathe from one day old. Perches should be provided. The optimum height above the floor varies for different breeds, ages and housing conditions and perch heights should be adjusted in response to the birds' behaviour by seeing how easily birds can get on and off perches and move between them. All birds should be able to perch at the same time and every adult bird should be allowed 15 cm of perch at each level. More space may be required depending on the species in order to provide sufficient space to avoid aggression.⁷⁴

It is recommended that, especially during the establishment of groups, birds are briefly observed during dark periods to confirm that all individuals are roosting.

2.3.3 Dimensions and flooring

Fowl are highly motivated to perform 'comfort behaviour', such as wing flapping, feather ruffling and leg stretching, which helps to maintain strong leg bones. Birds should therefore be housed in floor enclosures large enough to permit all of these behaviours whenever possible.

It is recommended that flooring for fowl is solid, as this enables the provision of substrate to encourage foraging and possibly help to reduce the incidence of feather pecking. If fowl need to be caged for scientific purposes, it is strongly recommended that they are housed in enclosures designed to address behavioural requirements. If there are scientific reasons for not providing a solid floor, it is strongly recommended that a solid area with loose substrate and items such as bunches of string, pecking blocks, rope, turf or straw is provided for pecking.

⁷⁴ These measures are considered necessary in order to fulfil the requirements of the 'CoP' *Standards applicable to all animals*



2.3.4 Feeding

See Part 1: Advice applicable to all birds.

2.3.5 Watering

See Part 1: Advice applicable to all birds.

2.3.6 Substrate, litter, bedding and nesting material

A loose substrate such as wood shavings or straw within nest boxes promotes nesting behaviour. Substrate needs to be regularly replaced and kept clean. Suitable materials for dust-bathing include sand or soft wood shavings.

2.3.7 Cleaning

See Part 1: Advice applicable to all birds.

2.3.8 Handling

See Part 1: Advice applicable to all birds.

2.3.9 Humane killing

See Part 1: Advice applicable to all birds.

2.3.10 Records

See Part 1: Advice applicable to all birds.

2.3.11 Identification

See Part 1: Advice applicable to all birds.

3 Additional advice applicable to domestic turkeys

Wild turkeys regularly utilise a diverse range of environments and perform a variety of behaviours including dust-bathing, foraging and hunting. The social behaviour of the wild turkey is complex, particularly during the breeding season. Domestic turkeys (*Meleagris gallopavo*) retain many of the characteristics of wild birds but there are some fundamental differences, for example domestic turkeys are unable to fly but have retained the ability to run quickly, and jump and glide, especially at younger ages.

3.1 Environmental conditions

3.1.1 Ventilation

See Part 1: Advice applicable to all birds.

3.1.2 Temperature

See Part 1: Advice applicable to all birds.

3.1.3 Humidity

See Part 1: Advice applicable to all birds.

3.1.4 Lighting

See Part 1: Advice applicable to all birds.



3.1.5 Noise

See Part 1: Advice applicable to all birds.

3.1.6 Alarm systems

See Part 1: Advice applicable to all birds.

3.2 Health

Lameness is a common problem and needs to be carefully monitored. It is advisable to develop a policy for dealing with lameness, in consultation with a veterinary surgeon.

3.3 Housing, enrichment and care

3.3.1 Housing

Domestic turkeys are highly social and should not be single housed unless on animal health or welfare grounds, or unless permitted by Project Licence authority. Stable groups should be formed as soon as birds are acquired and adequate monitoring is essential as injurious feather pecking and head pecking can occur from the first day of life.

3.3.2 Enrichment

Straw bales may be used for enrichment and to provide a refuge from dominant birds, but will need to be frequently replaced. Older, heavier birds may need ramps to gain access to them.

Turkeys require perches to be placed at a height where birds on the ground are not able easily to peck and tug at the feathers of perching birds. If birds are older and less agile, the access to perches may need to be facilitated by special equipment such as ramps. Where this is not possible, perches are best placed at a low height (for example at 5 cm). The shape and size of the perch should be selected with consideration for the rapidly growing claws of the birds. Perches are preferably ovoid or rectangular with smoothed corners and made of wood or plastic.

3.3.3 Dimensions and flooring

See Part 1: Advice applicable to all birds.

3.3.4 Feeding

See Part 1: Advice applicable to all birds.

3.3.5 Watering

See Part 1: Advice applicable to all birds.

3.3.6 Substrate, litter, bedding and nesting material

Substrate for dust-bathing should always be provided. Suitable materials are fresh sawdust or sand.⁷⁵

3.3.7 Cleaning

See Part 1: Advice applicable to all birds.

3.3.8 Handling

See Part 1: Advice applicable to all birds.

3.3.9 Humane killing

See Part 1: Advice applicable to all birds.

⁷⁵ This is considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals



3.3.10 Records

See Part 1: Advice applicable to all birds.

3.3.11 Identification

See Part 1: Advice applicable to all birds.

4 Additional advice applicable to quail (*Coturnix* spp; *Colinus virginianis*; *Lophortyx californica*; *Excalfactoria chinensis*)

Wild quail live in small social groups and devote much of their time to scratching and foraging for seeds and invertebrates on the ground. The preferred habitat of many species is dense vegetation such as grasslands, bushes alongside rivers and cereal fields. Domestication does not appear substantially to have altered quail behaviour, so it is essential to design housing systems that respect this and allow the provision of substrate for scratching, pecking and dust-bathing, nest boxes and cover wherever possible. The housing of quail in aviaries or pens as opposed to cages is therefore strongly recommended.

4.1 Environmental conditions

4.1.1 Ventilation

See Part 1: Advice applicable to all birds.

4.1.2 Temperature

See Part 1: Advice applicable to all birds.

4.1.3 Humidity

See Part 1: Advice applicable to all birds.

4.1.4 Lighting

See Part 1: Advice applicable to all birds.

4.1.5 Noise

See Part 1: Advice applicable to all birds.

4.1.6 Alarm systems

See Part 1: Advice applicable to all birds.

4.2 Health

See Part 1: Advice applicable to all birds.

4.3 Housing, enrichment and care

4.3.1 Housing

Quail are typically group housed in either all female or mixed-sex groups. Where the sexes are mixed, the ratio of males to females is typically low (for example, 1 to 4) to reduce aggression between males and injuries to females. It may be possible to pair house males if stable pairs are formed during rearing. The likelihood of aggressive pecking leading to skin lesions and feather loss is reduced if quail are not kept under intensive conditions and established groups are not mixed.



If quail need to be housed in cages, consideration should be given to combining enclosures and adding enrichment items. Solid enclosure roofs may make birds feel safer, although this could result in unacceptably low light levels in lower enclosures if birds are housed in racks. Birds should ideally be cage housed for the minimum possible period because many welfare problems become more severe with age, especially in birds kept for one year or more.

It is recommended that the enclosure roof is made of pliant material where possible to reduce the risk of head injuries.

4.3.2 Enrichment

It is recommended that quail chicks have access to coloured objects such as balls, tubing and cubes to alleviate fear of both human beings and novel stimuli as adult birds. Appropriate enrichment for adult birds are objects to peck such as stones, pine cones, balls and branches of vegetation.

4.3.3 Dimensions and flooring

See Part 1: Advice applicable to all birds.

4.3.4 Feeding

See Part 1: Advice applicable to all birds.

4.3.5 Watering

See Part 1: Advice applicable to all birds.

4.3.6 Substrate, litter, bedding and nesting material

Quail require sand, wood shaving or straw substrate for foraging, and a place to which the birds can withdraw, with additional dust-baths of sand or sawdust if the foraging substrate is not suitable for dust-bathing. Laying hens require access to nest boxes and nesting material, such as hay.

4.3.7 Cleaning

See Part 1: Advice applicable to all birds.

4.3.8 Handling

Quail are capable of extremely rapid startle responses, which can lead to head injuries. Staff are therefore advised to always approach birds slowly and calmly and it is advisable to provide quail with cover and environmental enrichment, especially early in life, in order to reduce fear.

4.3.9 Humane killing

See Part 1: Advice applicable to all birds.

4.3.10 Records

See Part 1: Advice applicable to all birds.

4.3.11 Identification

See Part 1: Advice applicable to all birds.

5 Additional advice applicable to ducks and geese

Domestic ducks and geese commonly used in research and testing include *Anas platyrhynchos*, *Anser anser domesticus* and *Cairina moschata*. All waterfowl are primarily adapted for locomotion and feeding in water, which is also very important for 'comfort' behaviours such as bathing and preening.



Domestic geese and ducks have been selected for meat and egg production, but all breeds retain most of their 'wild type' behaviour and are generally more nervous and easily upset than other domestic birds, especially when they are moulting.

5.1 Environmental conditions

5.1.1 Ventilation

See Part 1: Advice applicable to all birds.

5.1.2 Temperature

See Part 1: Advice applicable to all birds.

5.1.3 Humidity

See Part 1: Advice applicable to all birds.

5.1.4 Lighting

See Part 1: Advice applicable to all birds.

5.1.5 Noise

See Part 1: Advice applicable to all birds.

5.1.6 Alarm systems

See Part 1: Advice applicable to all birds.

5.2 Health

See Part 1: Advice applicable to all birds.

5.3 Housing, enrichment and care

5.3.1 Housing

Ducks and geese should be housed on solid floors and have sufficient space to permit foraging, walking, running and wing flapping. Non-solid floors may cause injury to the animals⁷⁶. Ducks and geese should always be kept outdoors or have access to outdoor runs unless there is scientific or veterinary justification for keeping them indoors. Birds housed with outside access should be kept secure from predators and should be supplied with a dry shelter to enable them to rest⁷⁷. Vegetation for cover and/or grazing will often be required.

Ducks and geese should be housed in appropriately sized groups wherever possible and the amount of time when any individual is left alone should be minimised. Many species become territorial during the breeding season, however, so it may be necessary to reduce group sizes and ensure that there is sufficient enclosure space to reduce the risk of injury, particularly to female birds.

From 2017, ducks and geese must be provided with a pond⁷⁸, and it is recommended that this has a mixture of stones and grit on the bottom, both to increase the birds' behavioural repertoire and to encourage adequate maintenance of the feathers. Behaviourally, the minimum requirement for waterfowl is to be able to immerse their heads under water and shake water over their bodies. It is recommended that drinkers and ponds for waterfowl are located over grid areas with drains beneath to reduce flooding.

It is recommended that water is provided to facilitate swimming behaviour within 24 hours of hatching and throughout the first week of life, but care should be taken to minimise the risk of drowning by,

⁷⁶ See the 'CoP' Standards applicable to all animals

⁷⁷ These recommendations are considered necessary in order to fulfil the requirements of the 'CoP' Standards applicable to all animals

⁷⁸ See the 'CoP' Chapter 9



for example, the use of a shallow bowl. After the first week, a shallow pond with large stones on the bottom is recommended with food or grit scattered among the stones to encourage dabbling or diving, as appropriate.

In the absence of the parent birds, it is advisable that access to ponds for juvenile birds is only under supervision to ensure that they can leave the water and do not become chilled. This should continue until they are clearly capable of leaving the water unaided and their waterproof feathers have begun to emerge. It is not necessary to control the temperature of the water. It is advisable to regularly clean ponds and replace the water as necessary to ensure good water quality.

5.3.2 *Enrichment*

It is strongly advised to provide a complex environment, including, for example, natural or artificial cover, boxes and straw bales. Serious consideration should be given to supplying other features of the habitat that are likely to be important to each species whether birds are housed indoors or outdoors. This includes shallow water with vegetation for dabbling ducks, turf for geese and deeper water with large stones for species whose natural habitat is along rocky coastlines.

5.3.3 *Dimensions and flooring*

See Part 1: Advice applicable to all birds.

5.3.4 *Feeding*

See Part 1: Advice applicable to all birds.

5.3.5 *Watering*

See Part 1: Advice applicable to all birds.

5.3.6 *Substrate, litter, bedding and nesting material*

See Part 1: Advice applicable to all birds.

5.3.7 *Cleaning*

See Part 1: Advice applicable to all birds.

5.3.8 *Handling*

See Part 1: Advice applicable to all birds.

5.3.9 *Humane killing*

See Part 1: Advice applicable to all birds.

5.3.10 *Records*

See Part 1: Advice applicable to all birds.

5.3.11 *Identification*

See Part 1: Advice applicable to all birds.

6 Additional advice applicable to pigeons

The various strains of domestic pigeon are believed to derive from the rock dove *Columbia livia*. Rock doves nest and roost on cliffs or within caves, and feral pigeons will utilise sheltered ledges on man-made structures in the same way. In their natural habitat pigeons usually occur in pairs to large flocks, feeding and roosting together, but will defend roosting spaces and nesting areas.



6.1 Environmental conditions

6.1.1 Ventilation

See Part 1: Advice applicable to all birds.

6.1.2 Temperature

See Part 1: Advice applicable to all birds.

6.1.3 Humidity

See Part 1: Advice applicable to all birds.

6.1.4 Lighting

See Part 1: Advice applicable to all birds.

6.1.5 Noise

See Part 1: Advice applicable to all birds.

6.1.6 Alarm systems

See Part 1: Advice applicable to all birds.

6.2 Health

Care should be taken when choosing a breed for experimental use, as some strains may show abnormal or undesirable behaviours and should therefore be avoided.

6.3 Housing, enrichment and care

6.3.1 Housing

Pigeons can be housed in mixed groups, and may lay eggs but will not incubate them if nest boxes are not provided.

Pigeons should be allowed an area sufficient for flight wherever possible, with a separate perching area for each bird along at least one wall of the enclosure. Pigeons benefit from the provision of box perches approximately 30 cm × 15 cm located in blocks. Branches hung from the roof and scaffolding can also be used for perching. Each enclosure should ideally have shallow water baths.

6.3.2 Enrichment

Larger, enriched enclosures with shelving, perches and toys should be used wherever possible rather than 'standard' pigeon enclosures. Pigeons benefit from being able to forage and should not be kept on grid floors without Project Licence authority. Grid floors are considered detrimental to the health of the animals.⁷⁹

Pigeons benefit from the provision of toys hung from chains, for example, bird bells, mirrors and commercially available toys designed for pets.

6.3.3 Dimensions and flooring

See Part 1: Advice applicable to all birds.

6.3.4 Feeding

Pigeons are primarily seed eaters but are omnivorous, so it is advisable to regularly offer food containing animal protein.

⁷⁹ See 'CoP' *Standards applicable to all animals*



6.3.5 Watering

See Part 1: Advice applicable to all birds.

6.3.6 Substrate, litter, bedding and nesting material

See Part 1: Advice applicable to all birds.

6.3.7 Cleaning

See Part 1: Advice applicable to all birds.

6.3.8 Handling

Where pigeons need to be handled frequently, 'nesting areas' or chambers can be provided so that birds can be trained to retreat to them for capture.

6.3.9 Humane killing

See Part 1: Advice applicable to all birds.

6.3.10 Records

See Part 1: Advice applicable to all birds.

6.3.11 Identification

See Part 1: Advice applicable to all birds.

7 Additional advice applicable to zebra finches

Zebra finches (*Taeniopygia guttata*) occur across most of Australia. They are highly mobile, ranging over wide areas in search of food, and live in flocks of up to several hundred individuals. The species is monogamous and sexually dimorphic, as the male's plumage is more ornate than that of the female. The breeding season is not fixed, but is triggered by the availability of ripening grass seeds. Zebra finches use nests for roosting as well as breeding; roosting nests are used more frequently in cold conditions and may be old breeding nests or purpose-built.

7.1 Environmental conditions

7.1.1 Ventilation

See Part 1: Advice applicable to all birds.

7.1.2 Temperature

Additional heating will often be required for birds housed outdoors in cold conditions.

7.1.3 Humidity

See Part 1: Advice applicable to all birds.

7.1.4 Lighting

See Part 1: Advice applicable to all birds.

7.1.5 Noise

See Part 1: Advice applicable to all birds.

7.1.6 Alarm systems

See Part 1: Advice applicable to all birds.



7.2 Health

See Part 1: Advice applicable to all birds.

7.3 Housing, enrichment and care

7.3.1 Housing

Zebra finches are social and non-breeding birds should be housed in groups. Unwanted breeding can be prevented by housing in single-sex groups, or suppressed in mixed-sex groups by withholding both roosting and breeding nests and by feeding a diet of dry seeds supplemented with fresh greens, but never soaked or sprouted seeds. Nests should be provided for breeding birds, for example in the form of wicker or plastic baskets or wooden boxes with dried grass, paper strips or coconut fibres for nesting material, but birds will defend these and it is important to monitor behaviour to ensure that sufficient nests are provided. As zebra finches feed extensively on the ground, it is appropriate to house birds on solid floors to facilitate natural foraging behaviour.

Perches are particularly important for well-being and should ideally be provided at a range of heights to facilitate normal feeding and roosting behaviour. It is recommended to provide water for bathing at least once a week in shallow trays with water of approximately 0.5 to 1 cm in depth.

Zebra finches thrive in outdoor enclosures provided they have access to shelter and roosting nests where appropriate.

7.3.2 Enrichment

Toys, perches and swings designed for pet birds will benefit zebra finches and these should be provided wherever possible.

7.3.3 Dimensions and flooring

See Part 1: Advice applicable to all birds.

7.3.4 Feeding

It is appropriate to continually provide sprays of panicum millet as dietary enrichment.

7.3.5 Watering

See Part 1: Advice applicable to all birds.

7.3.6 Substrate, litter, bedding and nesting material

See Part 1: Advice applicable to all birds.

7.3.7 Cleaning

See Part 1: Advice applicable to all birds.

7.3.8 Handling

See Part 1: Advice applicable to all birds.

7.3.9 Humane killing

See Part 1: Advice applicable to all birds.

7.3.10 Records

See Part 1: Advice applicable to all birds.



7.3.11 Identification

Fitting zebra finches with coloured leg bands for identification can have significant effects on their social and reproductive behaviour (for example, red can enhance dominance and green or blue reduce it). Care should be taken in the selection of colours and patterns of leg bands.



Chapter 10: Fish

This chapter must be read in conjunction with the CoP, the Introduction and Chapter 1: Advice applicable to all animals.

1 Introduction

A wide variety of fish species are used for experimental purposes and these have a diverse range of habitats, behaviour and environmental and husbandry requirements.

Fish are ectothermic animals and highly sensitive to their particular aquatic environment. They react very rapidly to stress with immediate physiological consequences that can be relatively long-lasting and such changes, as well as having obvious welfare implications, will also impact upon experimental results.

Investigators and animal care staff should acquaint themselves with the biology, behaviour and ecology of the proposed experimental fish species, to ensure that appropriate facilities and husbandry procedures are in place before animals are obtained. Species-specific guidance should be sought from expert specialists and care staff to ensure that any particular species' needs are adequately addressed.

2 Environmental conditions

2.1 Water supply

It is essential that an adequate water supply of suitable quality is provided at all times. Water flow in re-circulatory systems or filtration within enclosures should be sufficient to remove suspended solids and wastes and to ensure that water-quality parameters are maintained within acceptable levels. Monitoring systems should be in place to ensure that fish are provided with an appropriate quantity of water of appropriate quality.⁸⁰

2.2 Water quality

Water quality is the most important factor in maintaining the well-being of fish and in reducing stress and the risk of disease. The definition of acceptable ranges is complicated in that optimum conditions are not well defined for many species and that the requirements of individual species may vary between different life stages, for example larvae, juveniles, adults, or according to physiological status, for example metamorphosis, spawning, feeding, previous history of exposure.

Fish show varying degrees of adaptability to changing water-quality conditions. Some degree of acclimatisation may be necessary and this should be carried out for a period appropriate for the fish species in question.

As most fish species cannot function well in water containing a high level of suspended solids, it is advisable to maintain these within an acceptable range. Where necessary, water supply to facilities should be appropriately filtered to remove substances harmful to fish and to maintain suitable water physico-chemical parameters.

2.2.1 Oxygen

Required oxygen concentration will vary according to species of fish, its size, feeding level and amount of handling, as well as the environmental temperature, carbon dioxide concentration and salinity of the water.

2.2.2 Nitrogen compounds

Ammonia and urea are the main excretory products of fish. Dissolved urea, as well as food and faeces, are converted to inorganic compounds such as ammonia and phosphate. Ammonia will be

⁸⁰ These recommendations are considered to be necessary in order to meet the requirements of the 'CoP' Standards applicable to all animals



further converted into nitrite and nitrate. Ammonia and nitrite are toxic to fish and their accumulation should be avoided by increasing flow rate, reducing stocking density or temperature, or biofiltration.

Susceptibility to the effects of ammonia varies between fish species and in general marine and younger fish are more susceptible. The toxic form of ammonia is unionised ammonia, the amount of which depends not only on total ammonia concentration but also on pH, salinity and temperature.

2.2.3 Carbon dioxide

Carbon dioxide is produced by fish during respiration and dissolves in water to form carbonic acid, thus lowering the pH. Accumulation of carbon dioxide can be a problem at a high stocking density if pure oxygen is used instead of air to maintain the oxygen content in the water. Although high concentrations of free carbon dioxide can be fatal to fish this is most unlikely to be a problem under normal housing conditions. However, care should be taken that water-supply systems, particularly in the case of groundwater-based systems, do not introduce harmful quantities of carbon dioxide into the enclosures.

2.2.4 pH

Acceptable pH levels depend on many water-quality factors, for example, carbon dioxide and calcium. As far as possible, pH should be kept stable as any changes in pH will influence other water-quality parameters. In general pH tends to be lower in fresh water than in salt water. If necessary, supply water should be buffered. In the wild pH is rarely constant, but fluctuates within a range, often diurnally and certainly seasonally.

2.2.5 Salinity

Salinity requirements of fish will vary according to whether they are marine or freshwater in origin or adapted. Some species are able to tolerate a wide range of salinity. In others salinity tolerance may vary according to life stage. Changes in salinity should be made at a rate appropriate for the purpose and species.

2.3 Temperature

At high temperatures it may be necessary to provide supplementary aeration or oxygenation of enclosure water. Changes in temperature should be made at a rate appropriate for the purpose and species. Increasing water temperature without de-gassing the water can cause super-saturation with carbon dioxide and other gases, leading to gas bubble disease.

2.4 Lighting

Many fish require light for feeding and other behavioural activities. Fish should be maintained on an appropriate photoperiod as far as possible since the day/night cycle influences the physiology and the behaviour of fish. Many fish species should not normally be kept in bright light, although some tropical species naturally encounter very bright light. As appropriate for the species, it is advisable that lighting is subdued or tanks covered. Abrupt changes in light should be avoided as far as possible, and phased sunrise and sunset is recommended, as appropriate for the species.

2.5 Noise and vibration

Fish can be acutely sensitive to sounds and vibrations, even at very low levels. Fish reared in a particular environment will adapt to the stimuli presented there and may become stressed if moved to unfamiliar surroundings. It is advisable to take reasonable steps to avoid sudden noise and vibration. It is advisable to situate plant in a separate room to tanks wherever possible.

3. Health

Appropriate attention should be paid to hygiene within experimental facilities. The health of fish is intimately bound up with their environmental and husbandry conditions. Deficiencies in environmental and husbandry conditions cause stress that often results in disease, and any attempt to control disease should give these areas due consideration. Fish health management is almost always



concerned with populations rather than single individuals, and it is advisable to design control measures accordingly.

3.1 Hygiene and disinfection

Thorough consideration should be given to the appropriate cleaning and disinfection of fish-holding facilities, including associated pipework. In closed systems, cleaning and disinfection should be compatible with maintenance of optimal microbiological conditions. Staff should take precautions to prevent cross-contamination between fish enclosures. Equipment, for example nets, should normally be cleaned and disinfected between uses. For tanks that are not on the same flow-through system, wherever possible separate equipment (e.g. nets) should be used to prevent cross-contamination.

3.2 Quarantine

Newly introduced stocks, both from farmed and wild fish, should be given an appropriate quarantine period, as far as possible separate from existing stocks. It is advisable to closely monitor the fish during quarantine and any disease problem which arises should be treated or the stock destroyed. It is advisable to procure farmed fish from reputable suppliers and as far as possible have a verified health status.

4. Housing, enrichment and care

4.1 Housing

Fish behaviour will influence stocking density and schooling or territorial behaviour should be considered. Measures should be taken to avoid or minimise aggression without otherwise compromising animal welfare. Acceptable stocking density for a given species will vary depending on water flow and current, water quality, as well as fish size, age, health and feeding method. For most species, it is advisable to keep fish in groups of the same-sized individuals to minimise the risk of injuries or cannibalism.

4.2 Enrichment

Environmental enrichment is often necessary to take account of behavioural traits, for example, in reproduction or predation. Examples of such needs include provision of hiding places for wrasse, flowing water for salmonids or substrate such as sand for some flatfish. Care is needed to ensure that environmental enrichment does not adversely affect water quality.

4.3 Fish-holding facilities

Fish can be maintained in land-based enclosures in dedicated buildings or in external areas, or in enclosures in open-water systems. Where practical, these should have controlled access and be arranged to minimise disturbance of the fish, and to facilitate maintenance of suitable environmental conditions.

4.4 Land-based enclosures

The materials used to construct the enclosures should be non-toxic, durable and with a smooth internal surface to prevent abrasions to the fish. Enclosures should be of an appropriate size to accommodate the required stocking density of fish and should be able to receive the necessary water flow. Enclosures should be of an appropriate shape to accommodate the behavioural needs and preferences of the particular experimental fish species; for example, circular enclosures are usually most appropriate for salmonids. Enclosures should be designed to prevent escape.⁸¹

It is advisable that, where possible, enclosures are self-cleaning to aid removal of waste products and surplus food.

⁸¹ These recommendations are considered to be necessary in order to meet the requirements of the 'CoP' *Standards applicable to all animals*



4.5 Open-water enclosures

Fish, especially marine species, may be kept in large floating enclosures. The enclosure dimensions, including depth, should permit active swimming and shoaling of the fish. Mesh size should permit good water exchange while preventing escape of fish. Enclosures should be designed to minimise the risk of attack by predators. Enclosures should be rigged so as to prevent their shape distorting in tidal flows or running water and thus trapping fish.⁸²

4.6 Feeding

Fish may be fed either on artificial diet or fresh/frozen natural food. Artificial diet is preferable, providing it meets the nutritional requirements of the species, and is acceptable to the fish. However, some fish species or life stages will not consume artificial diets. Artificial diets tend to have less impact on water quality, although some live natural diets (such as daphnia) are unlikely to compromise water quality and have the advantage that uneaten food need not be removed from the water.

Feeding rate and frequency will depend on a number of factors including temperature, size and maturity. As high temperature increases the metabolic rate, feeding level should also be increased. It may not always be necessary to feed fish daily. Presentation of diet is also very important to ensure adequate feeding. Consideration should be given to the number of meals per day, the age of the fish, the water temperature and the size of the pellet or food fragment offered. The feeding regime, palatability and the presentation of food should be designed to ensure that all fish obtain sufficient food.⁸³

4.7 Cleaning

All enclosures should be kept free of detrimental accumulations of suspended waste products or uneaten feed. Excess accumulation may affect water quality and thus damage fish health. It is advisable to regularly treat and clean enclosures to prevent fouling and reduced water exchange. Consideration should be given to eliminating the risk of back-flushing and consequent fouling of enclosure water and increase in the risk of infection. If enclosures are not self-cleaning, waste material should be siphoned off as necessary, generally as soon as possible after feeding. It is advisable to clean the sides and bottom of enclosures regularly to avoid detrimental build-up of algae and other detritus.* Care should be taken to minimise stress during cleaning.

*Certain species may benefit from controlled algal build-up to facilitate grazing behaviour. Cleaning regimes should therefore be sensitive to species-specific needs.

4.8 Handling

Fish may be severely stressed by handling and careful consideration should be given to keeping this to the minimum possible. Fish should not be handled in air, or if this is unavoidable the duration of exposure to air should be kept to an absolute minimum. When catching fish, methods of handling that allow fish to remain submerged in water are likely to reduce exertion, anoxia, stress and physical damage. Transferring fish in a vessel containing water or a darkened, water-filled scoop are believed to be better practice than netting. If a net must be used, careful consideration should be given to the frame and mesh size of the net. Knotted net mesh should be avoided as this is considered to usually be detrimental to the health of the animal.⁸⁴ Appropriate consideration should be given to disinfecting and rinsing nets in clean water before use. It is strongly advised to ensure that netting is done as gently and efficiently as possible.

Out of water fish should ideally be handled with wet gloves or wet hands and on a moist surface to avoid scale and mucus loss. Particular attention should be paid to handling practices to avoid desiccation, suffocation and other injury.

⁸² These recommendations are considered to be necessary in order to meet the requirements of the 'CoP' *Standards applicable to all animals*

⁸³ In order to meet the requirements of the 'CoP' *Standards applicable to all animals*

⁸⁴ In order to meet the requirements of the 'CoP' *Standards applicable to all animals*



Where required, fish should be kept under anaesthetic for as short a time as possible and be placed in clean aerated water for recovery. An effective concentration of anaesthetic should be maintained throughout the procedure.

4.9 Humane killing

In most cases, fish are preferably killed by either:

- an overdose of anaesthetic using appropriate route and anaesthetic agent for the size and species; when killed by immersion, fish should be left in the anaesthetic solution for at least five minutes following the cessation of opercular movement and/or vestibulo-ocular reflex (VOR); or
- concussion of the brain by striking of the cranium.

Death should be confirmed, for example, by physical destruction of the brain or exsanguination.

4.10 Records

It is advisable to maintain records on appropriate water-quality parameters, and the origin, number and species of fish held.

4.11 Identification

It is not always necessary or feasible to individually identify all fish within a facility. If it is necessary to mark fish for identification purposes, subcutaneous dye injection is considered the least invasive method of marking. Careful consideration is needed before more invasive methods such as fin clipping or tagging are used. Mechanical tagging should normally not be used unless no other method is suitable. Marking should generally be carried out under anaesthesia in order to ease handling and minimise the risk of injury, morbidity and stress.

5. Source, capture and transport

Please note: zebrafish – being schedule 2 species – must have been bred for use in procedures unless authorisation is given to the contrary in the Project Licence.

Unless licence authority permits it, fish used for experimental or other scientific purposes should be bred and reared in captivity. However, it is recognised that there are significant difficulties in breeding many species of fish in captivity and therefore this may not be possible. Where animals must be taken from the wild, care should be taken to prevent injury and stress to them during capture, loading, transportation and unloading.

Where wild-caught animals are intended to be used in regulated procedures, the Project Licence holder must take all reasonable steps to ensure that they are caught by a competent person. Injuries, illness or death of animals on or shortly after receipt may indicate unsuitable source, capture or transport. If such problems arise, the Project Licence holder should review these arrangements before obtaining more animals from that source. The importation of fish into the UK requires authority from other regulators.

Prior to transportation of significant distance, it is advisable to deprive fish of food for a period sufficient to allow the gut to clear and reduce faecal contamination of the transport system. This period will vary according to species, with smaller fish having much shorter clearance times than larger fish. Consideration should therefore be given to species, length of transport and water-quality factors when calculating the food deprivation schedule.

Care should be taken to prevent injury and stress to fish during capture, loading, transportation and unloading. Abrupt temperature changes, periods of hypoxia and any deterioration in water quality due to excretory products should be avoided.



6. Further reading

Comprehensive advice regarding zebrafish can be found in the RSPCA's document, "Guidance on the housing and care of zebrafish, *Danio rerio*"⁹⁰.

⁹⁰ Reed, B. & Jennings, M. (2010, updated 2011) "Guidance on the housing and care of zebrafish, *Danio rerio*" Research Animals Group, Science Department, RSPCA.
<http://www.rspca.org.uk/sciencegroup/researchanimals/reportsandresources/housingandcare>
(accessed 27/5/14).



Chapter 11: Amphibians

This chapter must be read in conjunction with the *CoP, the Introduction and Chapter 1: Advice applicable to all animals*.

1 Advice applicable to all amphibians

Please note: Frogs of the species *Xenopus laevis*, *Xenopus tropicalis*, *Rana temporaria* or *Rana pipiens* – being schedule 2 species – must have been bred for use in procedures unless authorisation is given to the contrary in the Project Licence.

Having regard to the Convention on International Trade in Endangered Species (CITES) and Commission Regulation 1158/2012, where possible, any amphibians used for experimental or other scientific purposes should be bred and reared in captivity. Purpose-bred animals should be used in preference to animals taken from the wild.

1.1 Environmental conditions

Amphibian species inhabit a vast range of different habitats under climatic conditions ranging from snow to desert. Advice on environmental requirements should be sought from expert specialists and care staff to ensure that any particular species' needs are adequately addressed.

1.1.1 Ventilation

Careful consideration should be given to the design of enclosures for amphibians to ensure that they are adequately ventilated. With increasing body weight, lung respiration dominates. The water in enclosures of aquatic housed amphibians should be filtered, circulated, and aerated as appropriate for the species and life stage.⁹¹ *Xenopus* spp. rarely inhabits highly oxygenated (flowing) water in the wild. Therefore, air stones are not necessary for *Xenopus*. If the purpose of air stones is to reduce the fouling of the water, then it is advisable to tackle this by more frequent water changes.

1.1.2 Temperature

Amphibians are ectothermic. Areas of different temperature and humidity are beneficial, to allow amphibians to seek their preferred microenvironment. Some amphibians, when exposed to frequent fluctuations in temperature and humidity within the enclosure, may be severely stressed and may be more prone to health problems. Room and water temperatures should be controlled as appropriate for the species and scientific requirements.

Hibernation in amphibians may be induced or interrupted by regulating light-dark cycles and room temperature. Before inducing hibernation in captivity, animals should normally be in good health and body condition. In animals used for breeding, a state of near winter torpor (for example dim light to darkness and low (e.g. 4°C) room temperature) may be simulated where appropriate. Under these conditions, animals can be kept without feeding for as long as four to five months. Restoration of pre-hibernation environmental conditions will induce activity and mating behaviour.

1.1.3 Humidity

Amphibians do not drink but absorb moisture through their skin. Water loss is an especially critical problem in captive terrestrial and semi-terrestrial amphibians, as proper hydration is essential to the normal function of the amphibian skin. Areas of different humidity within the enclosure – or different humidity over time – are beneficial. Even desert-adapted amphibians should ideally have access to a humid environment.

1.1.4 Lighting

It is advisable to use photoperiods reflecting the natural cycle from where the animals originate. Light levels in the enclosures are recommended to be consistent with that expected to be encountered

⁹¹ In order to meet the requirements of the 'CoP' *Standards applicable to all animals*



under natural conditions. It is advisable to ensure that both semi-terrestrial and aquatic housed animals have the opportunity to withdraw to shaded areas within the enclosure.

Incorporating a UV element is important for ensuring the health of some amphibians, such as many anurans. However, it should be noted that the mortality of some amphibians can be positively correlated with solar UV radiation. Furthermore, in some species, ambient levels of UV-B cause embryonic mortality in nature or cause deformities in amphibian embryos. Careful species-specific assessment of lighting needs is therefore required.⁹²

1.1.5 Noise

Amphibians are very sensitive to noise (airborne stimuli) and vibration (substrate-borne stimuli) and are disturbed by any new, unexpected stimulus. It is advisable, therefore, to minimise such extraneous disturbances.

1.1.6 Alarms

Adequate alarm systems are necessary if circulation systems are used and/or aeration is required.⁹³

1.2 Health

See Chapter 1: Advice applicable to all animals.

1.3 Housing, enrichment and care

1.3.1 Housing

Group housing of amphibians is advisable, for instance to improve feeding and reduce fear responses. For example, in *Xenopus spp.* group feeding promotes feeding frenzies inducing all animals to feed. At very low stocking densities such frenzies may not occur and food is frequently not eaten.

To avoid cannibalism in certain species (particularly among larval *Ambystoma spp.* and *Scaphiopus spp.*), it is advisable to maintain animals in small groups. Cannibalism in groups can be reduced by grading animals according to their size. *Xenopus laevis* froglets and young adults can be particularly prone to cannibalism, which can be reduced by separating them into groups of similar-sized individuals. Cannibalism can also be eliminated by providing adequate food. For both *Scaphiopus* and *Ambystoma*, larval cannibalism is often facultative, as response to both high density and reduced availability of alternative food. Almost any larval caudate will graze the limbs of conspecifics.

1.3.2 Enrichment

The terrestrial habitat of amphibians should normally be enriched, including, for example, branches, leaves, pieces of bark, stones or other suitable man-made materials.⁹⁴ Amphibians benefit from environmental enrichment in different ways: for example, inclusions allow animals to hide, and provide visual cues important for spatial orientation. It is recommended that the side walls of the terraria are textured to provide a structured surface.

The provision of hiding places/shelters that are appropriate to the amphibian's needs is recommended, because they can reduce stress. For example, in *Xenopus spp.* a tube of ceramic or plastic composed of a non-leaching material may be provided. Refuges should be inspected regularly for sick or injured animals. A dark floor to the tank may enhance the sense of security of the animals.

Materials used for enrichment devices should not be detrimental to the health of the amphibians. Unless designed for single use only, devices should ideally be made of materials that withstand chemical sterilisation or autoclaving. Enclosures and enrichment should have smooth surfaces and rounded edges to minimise the risk of injury to the amphibian's skin.⁹⁵

92 In order to meet the requirements of the 'CoP' *Standards applicable to all animals*

93 In order to meet the requirements of the 'CoP' *Standards applicable to all animals*

94 In order to meet the requirements of the 'CoP' *Standards applicable to all animals*

95 In order to meet the requirements of the 'CoP' *Standards applicable to all animals*



1.3.3 Dimensions and flooring

See Chapter 1: Advice applicable to all animals.

1.3.4 Feeding

The majority of amphibians are carnivores with food preferences for living small invertebrates (such as larvae, insects and worms), although larvae are filter feeders. It is advisable to maintain captive animals on their natural foods or on foodstuffs approximating those of their natural diets – adults can be given fish, meat or commercial diets. The required feeding frequency is related to environmental conditions, such as temperature and light intensity. Daily feeding is not advisable for adult animals in fill-and-dump systems, but once to three times weekly to satiation at each feeding is recommended. Commercial diets are available and, where used, the manufacturer's recommendations should be followed.

1.3.5 Water quality

For aquatic and semi-aquatic amphibians, water quality, including the concentration of ammonia and the pH level in the water, should be regularly monitored.⁹⁶

Ammonia is excreted by amphibians and its concentration will depend on the water-handling regime. A level of 5 mg/l would be cause for concern, although the degree of potential harm increases sharply with the pH of the water, as there is more ammonia and less NH_4^+ at higher pH.

1.3.6 Substrate, litter, bedding and nesting material

See Chapter 1: Advice applicable to all animals.

1.3.7 Cleaning

In order to avoid disease, it is advisable to carefully clean the terrestrial and aquatic areas in the terraria to remove dirt, excrement and food particles as appropriate. However, aggressive detergents should be avoided. The microbiome of amphibian skin provides a significant degree of innate immunity to the individual. Captive settings are known to reduce microbiome diversity, which can increase susceptibility to infections, for example with chytrid fungi. Cleaning regimes should therefore be designed carefully, taking this into account.

Amphibians explore their enclosures and will choose a favourite place (e.g. a stone or piece of bark) for drinking from or sleeping on. Amphibians become used to their enclosure. Therefore after cleaning it is important to return all enrichment to its original position.

1.3.8 Handling

Amphibians can be easily damaged. Care is required during handling, which should be kept to a minimum. Many species and some life stages respond negatively to latex gloves. Bare hands that retain soap or hand wash residues can also be hazardous during handling. Appropriate training is recommended.

1.3.9 Humane killing and anaesthesia

Pain perception in amphibians is likely to be analogous to mammals because amphibians possess neural systems for transmitting pain from peripheral receptors to the brain and antinociceptive mechanisms to modulate pain. Invasive, potentially painful procedures should be accompanied both by analgesia and anaesthesia, once an effective, safe protocol is identified.

It is important to consider that the tolerance to drugs may depend on the season. As amphibians' skin accounts for a significant portion of normal gaseous exchanges, in anaesthetised animals, in which lung respiration is reduced or interrupted, the skin should always be kept moist, for example with a wet tissue.

⁹⁶ In order to meet the requirements of the 'CoP' *Standards applicable to all animals*



1.3.10 Records

See Chapter 1: Advice applicable to all animals.

1.3.11 Identification

There are many types of amphibian used and different marking methods may be appropriate for different species. Where animals need to be identified individually there are a number of suitable methods such as transponders, tank labels for individually housed animals, photography of amphibia with complex markings or monitoring pigment or wart configurations. Chemical markings may be absorbed through the skin, possibly causing toxic effects. This may therefore require Project Licence authority. Toe clipping causes more than momentary pain or distress and therefore requires PPL authority. If the method you are considering using is not listed above contact your Inspector for advice.

1.4 Transport

For transport, careful consideration should be given to ensuring the provision of sufficient air and moisture and, if necessary, appropriate devices to maintain the required temperature and humidity during the journey.

2 Additional advice applicable to aquatic amphibians

2.1 Environmental conditions

2.1.1 Ventilation

See Part 1: Advice applicable to all amphibians.

2.1.2 Temperature

See Part 1: Advice applicable to all amphibians.

2.1.3 Humidity

See Part 1: Advice applicable to all amphibians.

2.1.4 Lighting

See Part 1: Advice applicable to all amphibians.

2.1.5 Noise

See Part 1: Advice applicable to all amphibians.

2.1.6 Alarms

See Part 1: Advice applicable to all amphibians.

2.2 Health

See Part 1: Advice applicable to all amphibians.

2.3 Housing, enrichment and care

2.3.1 Housing

Aquatic amphibians such as *Xenopus laevis* or amphibian larvae are housed in tanks and aquaria. These may be equipped with a gentle flow-through water system for the circulation of uncontaminated (for example, dechlorinated) water, a heating device to maintain suitable temperatures, and a compressed air supply. Care is needed to ensure that aeration does not cause injury to the animals.



or undue stress due to excessive water turbulence. Unless a proper flow system is in place, it is advisable to renew the water in the enclosures with water of an appropriate quality about twice a week.

For *Xenopus* spp., systems with regular changes of water (fill-and-dump systems) are sufficient for maintaining appropriate water quality (such as minimising levels in ammonia).

2.3.2 Enrichment

See Part 1: Advice applicable to all amphibians.

2.3.3 Dimensions and flooring

It is advisable to avoid long, narrow enclosures since they may restrict locomotor activity and social behaviour such as feeding frenzies.

2.3.4 Feeding

See Part 1: Advice applicable to all amphibians.

2.3.5 Water quality

See Part 1: Advice applicable to all amphibians.

2.3.6 Substrate, litter, bedding and nesting material

See Part 1: Advice applicable to all amphibians.

2.3.7 Cleaning

See Part 1: Advice applicable to all amphibians.

2.3.8 Handling

See Part 1: Advice applicable to all amphibians.

2.3.9 Humane killing and anaesthesia

See Part 1: Advice applicable to all amphibians.

2.3.10 Records

See Part 1: Advice applicable to all amphibians.

2.3.11 Identification

See Part 1: Advice applicable to all amphibians.

3 Additional advice applicable to semi-aquatic and semi-terrestrial amphibians

3.1 Environmental conditions

3.1.1 Ventilation

See Part 1: Advice applicable to all amphibians.

3.1.2 Temperature

See Part 1: Advice applicable to all amphibians.



3.1.3 Humidity

See Part 1: Advice applicable to all amphibians.

3.1.4 Lighting

See Part 1: Advice applicable to all amphibians.

3.1.5 Noise

See Part 1: Advice applicable to all amphibians.

3.1.6 Alarms

See Part 1: Advice applicable to all amphibians.

3.2 Health

See Part 1: Advice applicable to all amphibians.

3.3 Housing, enrichment and care

3.3.1 Housing

It is advisable to keep semi-aquatic and semi-terrestrial amphibians in enclosures consisting of two parts: a terrestrial and an aquatic part. The aquatic area of the terrarium should ideally allow animals to submerge. Unless a flow-through system is used, it is advisable to renew water at least twice a week. It is advisable to remove aquatic habitats during hibernation.

It is advisable to cover each terrarium to prevent escape. Where the walls of the terrarium are transparent it is advisable to paint or otherwise make them opaque. However, care should be taken to ensure that such measures do not prevent the access required to check the animals.

3.3.2 Enrichment

Additions to the interior design can include: soft-foamed plastic material on the floor near the pool area, stones, pieces of artificial bark material, artificial branches/leaves and shelves.

3.3.3 Dimensions and flooring

See Part 1: Advice applicable to all amphibians.

3.3.4 Feeding

See Part 1: Advice applicable to all amphibians.

3.3.5 Water quality

See Part 1: Advice applicable to all amphibians.

3.3.6 Substrate, litter, bedding and nesting material

It is advisable to avoid fine sawdust and any other related small-particle substrate, as it affects the sensitive body skin, harbours pathogens and is difficult to clean and re-use.

3.3.7 Cleaning

See Part 1: Advice applicable to all amphibians.

3.3.8 Handling

See Part 1: Advice applicable to all amphibians.



3.3.9 Humane killing and anaesthesia

See Part 1: Advice applicable to all amphibians.

3.3.10 Records

See Part 1: Advice applicable to all amphibians.

3.3.11 Identification

See Part 1: Advice applicable to all amphibians.

4 Additional advice applicable to arboreal amphibians

4.1 Environmental conditions

4.1.1 Ventilation

See Part 1: Advice applicable to all amphibians.

4.1.2 Temperature

See Part 1: Advice applicable to all amphibians.

4.1.3 Humidity

See Part 1: Advice applicable to all amphibians.

4.1.4 Lighting

See Part 1: Advice applicable to all amphibians.

4.1.5 Noise

See Part 1: Advice applicable to all amphibians.

4.1.6 Alarms

See Part 1: Advice applicable to all amphibians.

4.2 Health

See Part 1: Advice applicable to all amphibians.

4.3 Housing, enrichment and care

4.3.1 Housing

Having regard for the behaviour of different arboreal species, every effort should be made to allow for this by the provision of appropriate structures for climbing and resting. Given the climbing abilities of arboreal amphibians, measures should be taken to prevent them escaping from their enclosures. In addition, it is advisable to provide water in which they can submerge themselves or seek greater humidity. If water dishes are used, they should ideally be arranged in such a way that they are easy for the amphibians to enter and leave.

4.3.2 Enrichment

See Part 1: Advice applicable to all amphibians.



4.3.3 Dimensions and flooring

See Part 1: Advice applicable to all amphibians.

4.3.4 Feeding

See Part 1: Advice applicable to all amphibians.

4.3.5 Water quality

See Part 1: Advice applicable to all amphibians.

4.3.6 Substrate, litter, bedding and nesting material

See Part 1: Advice applicable to all amphibians.

4.3.7 Cleaning

See Part 1: Advice applicable to all amphibians.

4.3.8 Handling

See Part 1: Advice applicable to all amphibians.

4.3.9 Humane killing and anaesthesia

See Part 1: Advice applicable to all amphibians.

4.3.10 Records

See Part 1: Advice applicable to all amphibians.

4.3.11 Identification

See Part 1: Advice applicable to all amphibians.



Chapter 12: Reptiles

This chapter must be read in conjunction with the *CoP, the Introduction and Chapter 1: Advice applicable to all animals*.

1 Advice applicable to all reptiles

This chapter provides details of the basic housing and care conditions recommended for reptilian species commonly used for scientific purposes. Specific procedures may require the use of certain other species which do not fall into these categories, such as semi-aquatic, arboreal or rock-climbing reptiles. Should behavioural or breeding problems occur, or should further information on specific requirements for other species be required, advice should be sought from experts and care staff specialised in the species concerned, to ensure that any particular species' needs are adequately addressed.

Having regard to the Convention on International Trade in Endangered Species (CITES) and Commission Regulation 1158/2012, where possible, reptiles used for experimental or other scientific purposes should be bred and reared in captivity. Purpose-bred animals should be used in preference to animals taken from the wild.

1.1 Environmental conditions

1.1.1 Ventilation

Enclosures for reptiles should be adequately ventilated. However, to prevent escape, ventilation holes should be screen-covered.⁹⁷

1.1.2 Temperature

Reptiles are ectothermic. In order to maintain their body temperatures, under natural conditions they will select microenvironments in which they can gain or lose heat. Therefore, enclosures should offer the animals areas of different temperature (a temperature gradient), which will help to avoid research-biasing stress and distress arising from inappropriate environmental conditions.⁹⁸

Temperature requirements of different species vary considerably and may even fluctuate in the same species at different times of the year. In the laboratory, room and water temperatures should be controlled.⁹⁹ In many reptiles, sex determination and gonadal differentiation are temperature-dependent.

An incandescent lamp positioned over the platform provided as a resting area will allow basking reptiles to increase their body temperature. When the lights are turned off or are not used, a flat heating device may be inserted into the enclosure on which basking reptiles can lie to maintain body temperature. Where such heat sources are used and which allow direct contact between the animal and the source, the source temperature should not exceed 40°C in order to ensure that no injury is caused. Care should always be exercised when direct heat sources are used because even when there is the opportunity to move away from a focal heat source within an enclosure it is not uncommon for reptiles to remain in direct contact until third degree burns are inflicted. For this reason, heating devices should be thermostatically controlled and have appropriate guards to prevent animals from overheating and burning.

It is advisable to ensure that terraria of snakes or lizards from tropical biotopes are furnished with at least one warmth-plate.

97 These recommendations are considered necessary in order to meet the requirements of the 'CoP' Chapter 1 *Standards applicable to all animals*

98 These recommendations are also considered necessary in order to meet the requirements of the 'CoP' Chapter 1 *Standards applicable to all animals*

99 In order to meet the requirements of the 'CoP' Chapter 1 *Standards applicable to all animals*



1.1.3 Humidity

Humidity levels are often best controlled by alterations to the ventilation rate. The provision of areas of different humidity (humidity gradient) is beneficial. Humidity should always be tailored to the species' requirement.

1.1.4 Lighting

Appropriate light and dark regimes for each species, life stage, and time of the year should be provided.¹⁰⁰ Reptiles should normally have the opportunity to withdraw to shaded areas within the enclosure. It is advisable that light or sun lamps are not the sole source of heat. The provision of UVA and UVB radiation is necessary to stimulate the animal's production of vitamin D.

1.1.5 Noise

Reptiles are very sensitive to acoustic noise (airborne stimuli) and/or to vibratory noise (substrate-borne stimuli) and are disturbed by any new, unexpected stimulus. Squamate reptiles (e.g. snakes) can be extremely sensitive to vibrations on the substrate: many "hear" by sensing ground vibrations through a mandibular connection to the inner ear. They detect predators by their footfalls, so staff should be aware of this when approaching cages. It is advisable to minimise noise and vibratory disturbances.

1.1.6 Alarms

Adequate alarm systems should be provided if ancillary heating devices and/or water circulation systems are used and/or aeration is required.¹⁰¹ If alarms are used, it is advisable that they are "silent", so that they do not disturb the animals.

1.2 Health

See Chapter 1: Advice applicable to all animals.

1.3 Housing, enrichment and care

1.3.1 Housing

Accumulation of as much information as possible on the ethological needs of the species is a necessary prerequisite when planning to accommodate reptiles in groups. Few reptiles naturally live in groups.

Enclosures and enclosure furniture should have smooth surfaces and rounded edges to minimise the risk of injury, and consideration should be given to the use of opaque materials for the most sensitive species.

To prevent collision with clear glass, it is advisable to pattern the side walls of the terraria to provide a structured surface.

1.3.2 Enrichment

The habitat of reptiles should be structured to include, for example, natural or artificial branches, leaves, pieces of bark and stones.¹⁰² Reptiles benefit from environmental enrichment in different ways: for example, inclusions allow animals to hide, provide labels for visual and spatial orientation and will help to reduce stress.

1.3.3 Dimensions and flooring

See Chapter 1: Advice applicable to all animals.

¹⁰⁰ In order to meet the requirements of the 'CoP' *Standards applicable to all animals*

¹⁰¹ In order to meet the requirements of the 'CoP' *Standards applicable to all animals*

¹⁰² In order to meet the requirements of the 'CoP' *Standards applicable to all animals*.



1.3.4 Feeding

It is advisable to maintain captive reptiles on their natural foods or commercial diets approximating those of their natural diets. Many reptiles are carnivores (all snakes and crocodiles, most lizards, and some turtles), but some are vegetarian and others are omnivores. Some species exhibit very narrow and specific feeding habits. Reptiles, except for some snakes, can be trained to feed on dead prey. Therefore, it should normally not be necessary to feed live vertebrates. Feeding of live vertebrates, if absolutely necessary, should only be undertaken under the direction of the Named Veterinary Surgeon, and following careful consideration of the Secretary of State's Standards of Modern Zoo Practice. When dead vertebrates are used, they should have been humanely killed using a method that avoids the risk of toxicity to the reptiles. Feeding regimes should be appropriate to the species, stage of development and husbandry system.

1.3.5 Watering

Drinking water should be provided for all reptiles. Water plays an important role in skin shedding and some reptiles drink from droplets on foliage so misting may be required. Some reptiles require sufficient water in which to bathe.

1.3.6 Substrate, litter, bedding and nesting material

A variety of substrates may be used for terraria, depending on the requirements of the species. It is advisable to avoid fine sawdust and any other small-particle substrate, as this may cause serious mouth or internal injuries or bowel obstruction, particularly in snakes.

1.3.7 Cleaning

In order to avoid disease, it is advisable to carefully clean the terrestrial and aquatic areas in the enclosure to remove dirt, excrement and food particles.

Aggressive detergents should be avoided. Reptiles explore their enclosures and will choose a favourite place (e.g. a stone or piece of bark) for drinking from or sleeping on, and they become used to their enclosure's layout. Therefore after cleaning it is important to return all enrichment to its original position.

1.3.8 Handling

Care is needed when handling reptiles, as they can be easily injured. For example, some lizards may shed their tails (autotomy) if handled in an inappropriate way, and other species can easily be traumatised. It is advisable that staff receive specialist training and follow specialist safe working practices when working with large, aggressive or venomous species.

1.3.9 Humane killing

An appropriate method of killing is by an overdose of a suitable anaesthetic.

1.3.10 Records

See Chapter 1: Advice applicable to all animals.

1.3.11 Identification

Where animals need to be identified individually a number of suitable methods are available: transponders; enclosure labels for individually housed animals; monitoring individual skin patterns (according to colour, skin damages, etc.). Topically applied dye markings require renewal after skin shedding. Toe clipping is considered to cross the threshold for regulation and should not be done unless authorised by a Project Licence.



1.4 Transport

It is important to ensure that during transport reptiles are provided with adequate air and moisture. If necessary, appropriate consideration should be given to the provision of devices designed to maintain the required temperature and humidity.

2 Additional advice applicable to aquatic reptiles

2.1 Environmental conditions

2.1.1 Ventilation

See Part 1: Advice applicable to all reptiles.

2.1.2 Temperature

See Part 1: Advice applicable to all reptiles.

2.1.3 Humidity

See Part 1: Advice applicable to all reptiles.

2.1.4 Lighting

See Part 1: Advice applicable to all reptiles.

2.1.5 Noise

See Part 1: Advice applicable to all reptiles.

2.1.6 Alarms

See Part 1: Advice applicable to all reptiles.

2.2 Health

See Part 1: Advice applicable to all reptiles.

2.3 Housing, enrichment and care

2.3.1 Housing

Aquatic reptiles should normally be accommodated in tanks in which water is circulated, filtered and aerated. It is advisable to renew the water about twice per week, except in the case of flow-through systems. To minimise the bacterial contamination of the water, it is advisable that water temperatures do not exceed 25°C. It is recommended that water levels are sufficient for reptiles to submerge.

Platforms should be provided as a resting area onto which the reptiles can haul themselves or under which they can shelter. There should be two areas – one as a basking spot and the other in a cooler part of the enclosure. Such platforms should be made of suitable materials, such as wood, so that animals are able to get a purchase with their claws in order to pull themselves out of the water. Platforms should be replaced as necessary.¹⁰³

2.3.2 Enrichment

See Part 1: Advice applicable to all reptiles.

¹⁰³ These recommendations are considered necessary in order to meet the requirements of the 'CoP' *Standards applicable to all animals*



2.3.3 Dimensions and flooring

Platforms made of epoxy or polyurethane may not be appropriate as they are likely to deteriorate quickly under continuous warm temperatures.

2.3.4 Feeding

See Part 1: Advice applicable to all reptiles.

2.3.5 Water quality

See Part 1: Advice applicable to all reptiles.

2.3.6 Substrate, litter, bedding and nesting material

See Part 1: Advice applicable to all reptiles.

2.3.7 Cleaning

See Part 1: Advice applicable to all reptiles.

2.3.8 Handling

See Part 1: Advice applicable to all reptiles.

2.3.9 Humane killing and anaesthesia

See Part 1: Advice applicable to all reptiles.

2.3.10 Records

See Part 1: Advice applicable to all reptiles.

2.3.11 Identification

See Part 1: Advice applicable to all reptiles.

3 Additional advice applicable to terrestrial reptiles

3.1 Environmental conditions

3.1.1 Ventilation

See Part 1: Advice applicable to all reptiles.

3.1.2 Temperature

See Part 1: Advice applicable to all reptiles.

3.1.3 Humidity

See Part 1: Advice applicable to all reptiles.

3.1.4 Lighting

See Part 1: Advice applicable to all reptiles.

3.1.5 Noise

See Part 1: Advice applicable to all reptiles.



3.1.6 Alarms

See Part 1: Advice applicable to all reptiles.

3.2 Health

See Part 1: Advice applicable to all reptiles.

3.3 Housing, enrichment and care

3.3.1 Housing

Terrestrial reptiles should normally be kept in enclosures consisting of an appropriate terrestrial part and an aquatic part. It is recommended that the water area of the terrarium allows animals to submerge. It is advisable to renew the water at least twice a week, except in the case of a flow-through system.

It is advisable that terraria are transparent, have tight seams with all holes securely screened, and be provided with well-fitted lids or doors that can be securely fastened by latches, hooks or clasps. For housing venomous snakes, it is important to also fulfil certain security criteria.

It is advisable to construct doors and lids so that the entire top or an entire end or side opens to facilitate cleaning (except in the case of venomous reptiles). For some species, it is advisable that all walls and the top are opaque, except the front wall. In cases of highly irritable or easily frightened reptiles, the clear wall can be provided with a removable covering. It is advisable to construct walls of a non-reflective material rather than glass. Many species of reptiles are stressed by their own reflection because they see it as a trespassing competitor that never goes away. Also having other reptiles within sensing distance can be very stressful because they may see the other reptiles as predators.

The provision of appropriate shelter is important for all terrestrial reptiles, both in which to hide and also sometimes to feed. A shelter-box, such as a tube of clay, simulates the darkness of a burrow.

3.3.2 Enrichment

The provision of appropriate structures to climb on, such as branches, is very important for arboreal snakes.

3.3.3 Dimensions and flooring

Adequate enclosure height is very important for arboreal snakes.

3.3.4 Feeding

See Part 1: Advice applicable to all reptiles.

3.3.5 Water quality

See Part 1: Advice applicable to all reptiles.

3.3.6 Substrate, litter, bedding and nesting material

See Part 1: Advice applicable to all reptiles.

3.3.7 Cleaning

See Part 1: Advice applicable to all reptiles.

3.3.8 Handling

See Part 1: Advice applicable to all reptiles.



3.3.9 Humane killing and anaesthesia

See Part 1: Advice applicable to all reptiles.

3.3.10 Records

See Part 1: Advice applicable to all reptiles.

3.3.11 Identification

See Part 1: Advice applicable to all reptiles.



Chapter 13: Cephalopods

This chapter must be read in conjunction with the *CoP, the Introduction and Chapter 1: Advice applicable to all animals*.

1 Standards applicable to all cephalopods

1.1 Introduction

A wide variety of cephalopod species are used for experimental purposes and these have a diverse range of habitats and behaviour. Knowledge of environmental and husbandry requirements is limited to a small number of species and may differ significantly between species. Investigators and animal care staff should acquaint themselves with the characteristics of the cephalopod species proposed for the work, and advice should be sought from cephalopod specialists and appropriately experienced care staff to ensure that any particular species' needs are adequately addressed and that appropriate facilities and husbandry procedures are in place before animals are obtained.

1.2 Environmental conditions

Squid are pelagic, cuttlefish neo-benthic and octopus benthic and this should be considered for all housing and care. Specific conditions are not detailed in this code of practice but should be obtained from the relevant species-specific literature. A useful website is: <http://www.cephalopodresearch.org/>

1.2.1 Water supply

It is essential that an adequate water supply of suitable quality for each species is provided at all times. Water flow in re-circulating systems or filtration within enclosures should be sufficient to remove suspended waste and to ensure that water-quality parameters are maintained within acceptable levels that sustain normal activity and physiology for a given species and individual.

Systems should be in place to ensure that water parameters are checked regularly. There should be an alarm system linked to flow and water level.¹⁰⁴

1.2.2 Temperature

Cephalopods are exothermic, highly adapted to the marine aquatic environment and are therefore unlikely to tolerate rapid or significant changes in the quality or temperature of the water in which they are housed. They react rapidly to environmental changes/external stimuli with immediate physiological consequences that can be relatively long lasting. Such changes, as well as having potential welfare implications, will also impact upon experimental results. They have limited convergence with fish and assumptions for housing, care and use of these animals based on fish, whilst appropriate in some circumstances, should be made with caution. Temperature should be maintained within the optimal range for the particular species and requires careful control. Appropriate chilling/heating equipment should be in place. Where water changes are performed on a larger scale temperature spikes are more likely, and these may cause adverse effects or even death.

1.2.3 Water flow and quality

It is assumed that, as for other aquatic species, water quality is the most important factor in maintaining the health and well-being of cephalopods and in reducing stress and the risk of disease. Water-quality parameters should at all times be within the acceptable range that sustains normal activity and physiology for a given species and individual. The definition of acceptable range is complicated in that optimum conditions are not well defined for many species and it may not be possible to extrapolate between species. Optimum conditions may also vary between different life stages, e.g. paralarvae, juveniles, adults, or according to physiological status of the individual (e.g. females preparing to lay eggs).

Cephalopods eat a high protein diet. Ensuring protein levels do not build up in the system appears important. Protein skimmers and water flow should be suitably set up so that there is capacity to

¹⁰⁴ In order to meet the requirements of the 'CoP' *Standards applicable to all animals*



remove any ink. Ink could also act as an alarm substance and should be removed immediately to avoid stress to con- or closely related heterospecifics. Cuttlefish may release a considerable volume of ink. If capacity is insufficient to remove ink there will be a need to change the water in the system. Unless specifically required by the study, stimuli/manipulations likely to cause inking should be avoided where possible.

Cephalopods show little adaptability to changing conditions of water quality. Where animals need to be moved between tanks or systems it is therefore important to ensure water parameters are mirrored. Where necessary, water supply should be appropriately filtered to remove substances harmful to cephalopods and to maintain suitable water physico-chemical parameters. Cephalopods have well-developed olfaction/chemoreception. Although more research is needed, it is possible that they could be stressed if able to sense other animals which they consider rivals or predators, or which are ill or distressed, and consideration of their olfactory abilities should be made with respect to water supply and quality.

Water flow should enable cephalopods to maintain normal locomotion/behaviour. Cephalopods can use rapid expulsion of water through the funnel to power jet propulsion, which results in swift movement. Cuttlefish and squid have mantle adaptations to assist in other types of locomotion. Squid are in continuous motion due to their pelagic nature and water flows need to be high – in specialised tanks – to fulfil their requirements. Octopuses have a tendency to use their arms rather than jetting due to the reduced energy expenditure. Repetitive locomotion in cephalopods, such as jetting backwards continuously, is a sign of stress. Jetting can lead to collisions with the walls of the tank if animals are startled or there is insufficient space for escape reactions. Such jetting may cause permanent damage and retard growth.

1.2.3a Oxygen

Generally, cephalopods have high respiration rates and therefore oxygen levels are important for welfare. Oxygen concentration should be appropriate to the species and, based on other aquatic species, it is assumed that the required oxygen concentration will vary according to temperature, carbon dioxide concentration, salinity, feeding level and amount of handling. Cephalopods should generally be kept in highly aerated water and, where necessary, supplementary aeration of water should be provided. Specific levels have been reported for at least some species. Generally, levels should not be maintained significantly above 100% saturation as supersaturation may cause problems with gas exchange at the gills. This may be a particular issue with squid. Unlike some species of fish, cephalopods cannot facultatively breathe air so water flow should be checked more regularly than for other aquatic organisms. The provision of additional aeration for each tank may be required. This might be via the use of air stones, although consideration should be given to the possible effects of noise/vibration and the possibility of forming mucus bubbles and foaming if the protein level is high.

1.2.3b Nitrogen compounds

The accumulation of nitrogenous compounds should be avoided. Such accumulation may be reduced by more frequent cleaning of the tank, by increasing the flow of water known to be of low nitrate content, by reducing stocking density, or by increasing the quality of biofiltration in closed or semi-closed systems. Build-up of nitrogenous compounds may lead to behavioural changes and/or changes in skin colouration. At nitrate levels >80 mg/l, cuttlefish will be very agitated, will ink profusely and their skin tone may be dark. In addition, larvae and hatchlings become more vulnerable to bacterial disease. There is some anecdotal evidence which suggests ozone produced by some types of protein skimmers may have serious adverse effects on cephalopods. If such skimmers are used, there is the need for particularly close monitoring and it is generally advised that such systems be avoided where possible.

1.2.3c Carbon dioxide

Carbon dioxide is produced during respiration and dissolves in water to form carbonic acid, thus lowering pH. Since stability of pH is very important accumulation of carbon dioxide should be avoided. Situations which may increase carbon dioxide levels include high stocking density. Care should be taken that water supply systems, particularly groundwater-based systems if these are used as a basis for artificial seawater, do not introduce harmful quantities of carbon dioxide into the enclosures.



1.2.3d pH

Due to the effects of pH on the carriage of oxygen by blood pigments, cephalopods poorly tolerate low pH. Regular measurement and careful maintenance of pH is critical. Acceptable pH levels depend on many water-quality factors (e.g. carbon dioxide and calcium) and so control of water solutes and soluble gases is important. This may be a particular issue for establishments that use synthetic marine salts rather than natural seawater and closed filtration systems, especially where water changes are limited. Acceptable pH values for cephalopods are in the range of 7.8 to 8.2.

1.2.3e Salinity

Cephalopods are marine organisms, and therefore salinity is critically important with the level dependent on the natural salinity of the source of the animals. A typical range for European temperate species is 32–36 ppt.

1.2.3 f Metals

Copper is highly toxic to all species. Since this metal may be present in certain treatments for fish and in pipework, it is essential cephalopods are not in same system as fish under such treatments or where there is copper pipework. Caution should be used when fitting out systems. Expert advice should be sought and non-toxic materials be used in all fittings.

1.2.4 Lighting

Cephalopods appear to have good vision and may be startled by unexpected movements. It appears common to house cephalopods in ambient photoperiod. Species-specific needs should be met, and allowing animals to choose an appropriate level of light may be ideal. Typically, opaque covers or darkened areas are provided and/or dark sides for tank housing are used for adults. Abrupt changes in light level or regime should be avoided as far as possible.

1.2.5 Noise

At least one study has suggested that cephalopods can detect low frequencies of sound. In line with other aquatic species, they appear to dislike vibrations such as drilling or banging on tank sides and may respond by inking. It is recommended that plant is housed in an area separate from the animal housing if possible. It is considered that animals are likely to benefit from a quiet environment in order to minimise disruption and that, at a minimum, sudden noises which could startle them should be avoided, for example the covers of tanks should be removed cautiously and reduction of noise considered in the design of covers and other equipment.

1.2.6 Alarms

Alarms are advisable, with water level/flow and low oxygen among parameters considered. The positioning of such alarms may need to be considered with care as animals may attack or remove probes.

1.3 Health

1.3.1 General health

The health of cephalopods is intimately bound up with their environmental and husbandry conditions. Investigations of poor health must therefore always check for deficiencies in the environment and husbandry practices and any defects must be addressed promptly.

It is not always easy to assess the well-being of cephalopods, but changes in appetite, feeding response, behaviours (such as social interactions, position in the water column and presence of abnormal or reduced normal movement), physical appearance (such as skin texture and colour) and respiratory rate or depth may provide early warning of developing problems. Currently, indicators of potential pain, suffering or distress have yet to be defined and agreed for each species and this is urgently required.



Colour change, inking and jetting are known to occur in response to the presence of a predator in the wild and to conspecifics during breeding. If these occur in the laboratory, it is possible that the animal is finding a stimulus stressful and every effort should be made to minimise or eliminate exposure to the stressor. Signs that animals require close checking include lack of cleaning behaviour (removal of sucker discs) in octopuses and reduction in movement in squid. Indicators of good health would appear to include animals holding position at the bottom of the tank during the day for cuttlefish, although it may depend on age and lifecycle stage (adults will frequently hover, particular during breeding period) and use of the den during the day for octopuses, with more active behaviour at night for both.

1.3.2 Disease and injury

Water quality is essential for minimising disease, particularly bacterial infections. Much of the disease in cephalopods captured and kept in captivity appears to be related to trauma. For example, evidence of traumatic lesions such as partial limb loss (assumed to occur in predator/prey interactions) or sucker-induced trauma from confrontations between individuals has been recorded in wild-caught animals. Although some of these injuries do not appear to necessarily disadvantage individuals or to cause them significant discomfort, they may increase the risk of secondary infections and their incidence should be minimised on principle.

Self-induced trauma known as “butt-burn” is seen in cuttlefish, caused by jetting against tank sides in escape responses. This results in severe, focally extensive, ulcerative dermatitis and cellulitis of the dorsal apex of the mantle. These lesions can lead to mortality. Tank design (shape, size and water flow) is important to minimise the risk of such injuries. Injuries can also occur when bringing together individuals for breeding. Deaths through agonistic interactions can occur, with females suffering in particular. In cuttlefish, a ratio of two males to one female to reduce male/mating aggression has been suggested.

Ulcerative skin disease and swelling of one or both eyes have been reported. Live food may be a source of parasites and these, and other infections may be a source of illness. Bacterial infections have been recorded in cuttlefish. As with other species, it is likely that stress may be a factor in the development of such diseases. It is important to review potential health issues with a veterinarian, or other suitably qualified individual if there is no veterinarian with relevant knowledge and experience, and to implement a preventative medicine programme as appropriate.

Where possible, sick animals should be isolated to reduce the potential spread of infection to others, and any dead animals removed immediately since these may shed vast numbers of infectious organisms. Care should be taken that any waste water from tanks of isolated animals does not contaminate water supplies to other animals or the environment. An investigation of disease outbreaks should not only include the immediate cause, e.g. infectious agent, but possibly underlying causes such as adverse water quality. Failure to correct such factors will often result in a further outbreak of disease.

With age, cephalopods undergo the natural process of senescence (a process where the body appears to “shut down” after mating and the animal begins to die). The clinical signs of animals in senescence include reduced or absent drive to eat, poor skin quality, cloudy eyes and changed behaviour. It should be possible to distinguish this state from an animal that is showing similar signs due to disease, and good record keeping and knowledge of the age (where possible) and general health of individuals may help to differentiate the two. It is unknown whether animals experience any form of pain or suffering during senescence but the precautionary principle should be applied and the process taken into account when determining humane endpoints for studies involving cephalopods. In general, animals showing signs of senescence should be humanely killed, unless there is sound scientific or animal welfare justification for keeping them alive. For example, it could be justifiable to allow a senescing female octopus to survive in order for her eggs to develop, if there was also a justified use for the eggs or hatchlings themselves. Otherwise, both the senescing female and the embryos should be humanely killed.



1.3.3 Hygiene and disinfection

Appropriate attention should be paid to hygiene within experimental facilities. Holding facilities, including associated pipework, should be regularly cleaned and disinfected. In closed systems cleaning and disinfection should be compatible with maintenance of optimal microbiological conditions of filters. Equipment (e.g. nets) should be disinfected and washed between uses and should not be shared between different water systems to prevent the potential spread of infectious diseases.

1.3.4 Quarantine and acclimatisation

Little is known about the quarantine requirements for cephalopods, but in principle animals caught at different times or from different sources should not be held in the same tank or in systems where water from their tank will flow subsequently through tanks holding other cephalopods. Equipment such as nets should not be shared between tanks for a period of time that will ensure that animals carrying disease can be identified. As with other species, ideally, quarantined animals should be kept in a separate room with its own access, disinfection procedures and equipment, but it is accepted that cephalopods may go into fixed groups on entry to a facility which will remain separated for life and a separate quarantine area may not be necessary under these circumstances. If warranted, effluent water from quarantined animals should also be sterilised before disposal by chemical means or UV or ozonation treatment.

During the quarantine period animals should be monitored closely for unusual signs or behaviour, and detailed examinations made of any individuals which are considered to be abnormal. Diseased animals should be treated or the stock destroyed. Quarantine is also useful in acclimatising animals to new surroundings before experimentation. Sometimes change of environment, particularly slight changes in temperature, can cause egg laying in cuttlefish and this may therefore be induced during quarantine. Should this occur, consideration should be given to the normal breeding cycle for the species in terms of the role of maternal care and whether egg laying will result in senescence of the adults, with appropriate action taken if required to safeguard the welfare of the animals.

1.4 Housing, enrichment and care

The natural behaviour of cephalopods will influence acceptable stocking density, schooling, predatory and territorial behaviour. The stocking density should be based on the total needs of the individual species in respect of environmental conditions, health and welfare. This includes the need to perform a range of behaviours including social behaviour, normal exercise and appropriate feeding behaviours. Acceptable stocking density for a given species will vary depending on water flow and current, water quality, animal size, age, health and feeding method. There is substantial literature on how best to keep the more commonly used cephalopods. There are specific practices to be avoided for specific cephalopods, for example bare glass tanks for cuttlefish.

Animals should have sufficient water volume and flow for normal locomotion/movement. Measures should be taken to avoid or minimise conspecific aggression and cannibalism, particularly in the breeding season or where there could be territory-related antagonism. Such measures should not alter the overall welfare of the animal.

1.4.1 Enclosures

Cephalopods can be maintained in a variety of types of enclosures within dedicated buildings, in outside enclosures or in open-water systems. Facilities should be arranged to minimise the disturbance to animals from the movement or work of personnel. Animals should not be held outside in conditions that would cause them physiological or psychological stress or distress.

The materials used to construct the enclosures should be non-toxic, durable and with a smooth internal surface to prevent abrasions to the animals. Octopuses have very well developed tactile and olfactory/chemosensory systems and tank design should take this into consideration. Enclosures should be secured to minimise the risk of escape by jetting (squid and cuttlefish) or climbing (octopus).

Enclosures should be of an appropriate size to allow individuals to maintain normal locomotion/behaviour, accommodate the required stocking density and should be able to receive the necessary water flow. Enclosures should be of an appropriate shape to accommodate the behavioural needs



and preferences of the particular species; for example, enclosures with rounded ends and with a large tank floor area are most appropriate for cuttlefish. Enclosures should be appropriately designed to aid removal of waste products and surplus feed. There appear to be particular difficulties in maintaining water quality in closed systems because of the water flows required, especially if removal of ink becomes necessary. Keeping squid in particular in such systems is likely to be highly problematic.

1.4.2 Enrichment

There are significant differences in the needs of octopuses, cuttlefish, squid and nautilus, according to their different behavioural traits. Species- and stage-specific needs for water depth and flow, swimming space, conspecifics, substrate and hiding places should be taken into consideration. For example, a den is essential for octopuses and the needs for benthic and pelagic species are likely to differ, based on their natural habitats and behaviours. It has been suggested that cuttlefish benefit greatly from provision of fake or real seaweed which allows them to express their natural behaviours. Care is needed to ensure that environmental enrichment does not adversely affect water quality, but this should not impede the development of suitable measures to enhance the welfare of the animals.

1.4.3 Feeding

Cephalopods are predators with complex multi-lobular brains, complex behaviours, good vision and the capability for rapid movement. Generally, they have a high metabolic rate, grow rapidly and are short-lived. This is an area where it is considered that cephalopods differ significantly from fish. Cephalopods are carnivorous, with a strong preference for a live prey diet and some species and stages may be difficult or impossible to feed using artificial diets. Whilst it may be ethically preferable to use artificial diet, providing it meets the nutritional requirements of the species (especially high protein requirement), and it is acceptable to the animals, studies to date would indicate that growth and possibly welfare of the animals may be reduced by the use of artificial diets. Feeding of non-protected live prey (e.g. crustaceans) at least once a week where animals are on artificial diets is generally considered important to allow cephalopods to express the full range of their natural behaviours.

It is important that cephalopods are fed at an appropriate feeding rate and frequency, and this will depend on a number of factors including species, size, maturity and the type of food offered. Presentation of diet is very important to ensure adequate feeding. Feeding regime, palatability and the presentation of food should ensure that all individual cephalopods kept in the same tank obtain sufficient food. Particular attention should be paid to the feeding of young or wild-caught animals.

1.4.4 Handling

Cephalopods may be severely stressed by handling, which should therefore be kept to the minimum possible. When catching animals, nets should be avoided where possible. Buckets can be used to scoop out animals for transportation. Where nets cannot be avoided, nets with an appropriate frame and mesh size should be used. Knotted net mesh should be avoided as it may cause injury. Nets should be disinfected and rinsed in clean water before use. Animals should be kept in water at all times during netting as emersion in air will cause an elevated stress level. Training animals to enter a transfer container, possibly using food rewards, is likely to significantly reduce the stress of handling. Transport vessels should be covered, for example with a towel, to provide a dark environment. This helps keep the animal calm and reduces the risk of inking. Consideration should be given to whether training might be appropriate to minimise stress for any other procedures.

When animals are anaesthetised the duration should be as short as possible and the animals should be placed in clean aerated water for recovery. Research into efficacy and aversion of general anaesthesia in cephalopods is ongoing and it is important to regularly review the literature and adjust practice accordingly. Cephalopods exchange gases with the seawater by forcing water through their gills, using contraction of the mantle. When mantle movement is not possible, for example under deep general anaesthesia, there is a significant risk of the animal becoming anoxic. Where mantle movement is significantly reduced or stops assisted ventilation may be required. Cessation of breathing is highly undesirable and should lead to a review of the anaesthetic protocol. Particular attention should be paid to handling practices (including of anaesthetised animals) to avoid desiccation, suffocation and other injury. Cephalopods should be handled with wet gloves or wet



hands and on a moist surface to avoid damage. Cephalopods use haemocyanin, a copper-containing protein, to transport oxygen. As a result, their blood is colourless when adequately oxygenated, meaning that blood loss during procedures can be difficult to gauge.

1.4.5 Humane killing

Cephalopods should be killed using approved methods in accordance with Schedule 1 of ASPA – the only specified method being an overdose of an anaesthetic using a route and an anaesthetic agent appropriate for the size and species of animal – unless an alternative method is authorised in the Project Licence. In all cases, appropriate measures should be taken to confirm that death has occurred. Current evidence for the humaneness of specific anaesthetic agents and of other methods of killing is very limited and the most up-to-date information available should be sought. Generally, however, the preferred method is an overdose of an agent producing rapid general anaesthetic effects with minimum aversive responses, by immersion. Cephalopods should be left in the anaesthetic solution for a period appropriate to the type and concentration of the anaesthetic. Death should usually be confirmed by physical destruction of the brain, although this may be difficult for some species. Exsanguination may be suitable, but there is little or no information on its effectiveness in these species. Octopuses, cuttlefish and squid have two branchial hearts that move blood through the capillaries of the gills. A single systemic heart then pumps the oxygenated blood through the rest of the body. Transection of the dorsal aorta would ensure cessation of blood flow to the brain irrespective of any residual cardiac activity following terminal general anaesthesia.

1.4.6 Identification

It is not usually necessary or feasible to individually identify all cephalopods within a facility. Octopuses are generally housed individually whilst on study and therefore marking is usually unnecessary. Passive Integrated Transponder (PIT) tagging has been used in some species. Marking the shell or identifying unique patterning can be used for identification in nautilus. Squid and cuttlefish may be more problematic, but some methods have been described, at least for cuttlefish. Careful consideration is needed before the use of more invasive methods of tagging. Marking should generally be carried out under anaesthesia in order to ease handling and minimise the risk of injury, morbidity and stress.

1.4.7 Cleaning

All enclosures should be kept free of waste products or uneaten feed. If these are allowed to accumulate, water quality and thus animal health will be adversely affected. Where practicable, enclosures should be regularly drained and cleaned to prevent fouling and reduced water exchange. There should be no risk of back-flushing and consequent fouling of enclosure water with potential risk of infection. Waste material should be siphoned off as necessary, generally as soon as possible after feeding. The sides and bottom of enclosures should be cleaned regularly to avoid build-up of detritus which could adversely affect the health of the animals. Care should be taken to minimise stress during cleaning and it is likely that in most cases animals will need to be moved out of the tank while it is done. Consideration should be given to how animals can best be transferred to a holding tank and how long they can be held there if moved.

1.5 Source, capture and transport

Unless licence authority permits it, cephalopods used for experimental or other scientific purposes should be bred and reared in captivity. However, it is recognised that there are significant difficulties in breeding many species of cephalopod in captivity and therefore this may not be possible. Where animals must be taken from the wild, care should be taken to prevent injury and stress to cephalopods during capture, loading, transportation and unloading.

Where wild-caught animals are intended to be used in regulated procedures, the Project Licence holder must take all reasonable steps to ensure that they are caught by a competent person who has been adequately trained and assessed in the appropriate techniques. Injuries, illness or death of animals on or shortly after receipt may indicate unsuitable source, capture or transport. If such problems arise, the Project Licence holder should review these arrangements before obtaining more



animals from that source. The importation of cephalopods into the UK requires authority from other regulators.

Animals should be kept in water of the same temperature as that in which they were caught and be submerged at all times (running water is preferable). Holding and transport containers should be covered with opaque material. Periods of hypoxia and any deterioration in water quality due to excretory products should be avoided.

If captive stock is to be transported, it is highly preferable that eggs rather than live animals are moved. If live captive stock must be transported, container type, oxygenation and temperature maintenance are critical. Animals should be transported over as short a time as possible and periods of more than 24 hours are not recommended. Successful transport has been achieved using large plastic bags with added oxygen, placed in polystyrene boxes and transported under temperature- control conditions. Food withholding prior to transport, as is practised with fish, is not required, although it is commonly practised by some to reduce the build-up of nitrogenous waste for short journeys. Magnesium chloride anaesthesia has been used to minimise potential distress during longer distance transport. The benefits of such interventions should be considered on a case-by-case basis for the species and specific journey being undertaken.

Bibliography

1 Background

Researchers and technicians using animals in science should be fully aware of the evidence which demonstrates how the care and accommodation of animals can affect both animal welfare and scientific outcomes. This bibliography is intended to direct the reader to source material and additional information. These resources are likely to change over time as the science and practice of care, welfare and use of animals evolves.

This is a list of resources and recommended reading as available at the time of publication of the CoP. Many of these were recommended by our stakeholders, and we are grateful for this input. The AWERB, animal care staff and users may wish to use this list as a starting point when seeking information about how to provide optimal care and accommodation for animals at their establishment.

Please note that there is no intention that this material becomes, by default, additional mandatory standards. It should be critically reviewed, together with any more up-to-date information that may become available, in the context of local needs specific to a particular establishment.

In line with Article 27.1 (b) of the Directive 2010/63/EU, it is a requirement of the AWERB to establish a process for the review of bibliographic material - both that which is listed here and that found elsewhere. This will usually comprise:

1. A process for sourcing information that would inform good practice, and for communicating this within the establishment; and
2. A process for reviewing such information and deciding whether it constitutes sufficient justification for changing current practice; plus
3. A system for evaluating the outcome of any changes made, with respect to animal welfare and scientific outcomes.

The Named Information Officer (NIO) is responsible for ensuring that those dealing with animals in the establishment have access to information that they need about the species held there and procedures being performed. For more information of the roles and responsibilities of the NIO please see the Guidance on the Operation of the Animals (Scientific Procedures) Act 1986, Section 8.10.

We welcome contributions to this bibliography; please send your suggestions to ASRUBusinessSupport@HomeOffice.gsi.gov.uk.

2 General reading

2.1 Peer-reviewed references

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BVA/AFW/FRAME/RSPCA/UFAW Joint Working Groups on Refinement - see <http://www.RSPCA.org.uk/> and see individual sections below

FRAME - Promoting the 3Rs to the public, academia and industry. <http://www.frame.org.uk/>

Institute of Animal Technology <http://www.iat.org.uk/index.php>

NC3Rs (National Centre for the Replacement, Refinement & Reduction of Animals in Research) contains a large number of useful pages and information including an Information Portal: <http://www.nc3rs.org.uk/landing.asp?id=38> and webpages on housing and husbandry: <http://www.nc3rs.org.uk/category.asp?fid=1&catID=42> and Ethical review process <http://www.nc3rs.org.uk/category.asp?catID=6> (accessed 24/07/14)

DEFRA Codes of Practice: <https://www.gov.uk/government/publications/>

Royal Society for the Prevention of Cruelty to Animals (RSPCA) <http://www.rspca.org.uk/home> & <http://science.rspca.org.uk/sciencegroup/researchanimals/reportsandresources/housingandcare>

Universities Federation for Animal Welfare (UFAW) <http://www.ufaw.org.uk/index.php/>

2.4 Journals

Alternatives to Laboratory Animals - the journal of FRAME <http://www.atla.org.uk/>

Animal Welfare - the journal of the Universities Federation for Animal Welfare www.ufaw.org.uk/animal.php/

Applied Animal Behaviour Science - the official journal of the International Society for Applied Ethology (ISAE). www.applied-ethology.org/thejournalaabs.htm/

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3 Species-specific reading

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3.5 Ferrets

3.5.1 Non-peer-reviewed references

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3.6 Non-human primates

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3.6.3 Web resources

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3.7 Farm animals (including equines)

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3.8 Birds

This section includes both laboratory and farmed species of birds that are used in the research environment.

3.8.1 Peer-reviewed references

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