
Australian Animal Welfare Standards and Guidelines

Exhibited Animals

Crocodilian

Endorsed

Agriculture Ministers Forum (AGMIN)

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This document forms part of the Australian Animal Welfare Standards and Guidelines.

This document will be reviewed regularly.

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<http://www.animalwelfarestandards.net.au>

<https://www.dpi.nsw.gov.au/animals-and-livestock/animal-welfare/exhibit>

www.zooaquarium.org.au

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Contents

Introduction	4
Taxon preface	6
Definitions	7
1 Responsibilities	8
2 Security	9
3 Enclosures	10
4 Dietary and water requirements	13
5 Health	14
6 Reproductive management	16
7 Euthanasia	17
8 Capture and restraint	18
9 Training	19
10 Interactive programs	20
11 Transportation	21
12 Animal identification and records	23
Appendix 1	24
Appendix 2	25

Introduction

Purpose

The principal purpose of this document is to describe standards and guidelines that ensure the welfare and security of *crocodilians* used for *exhibition purposes*.

This document promotes measures and conditions that, if implemented, would see *exhibited crocodilians* kept to the same standard throughout Australia.

The document considers a broad range of operational issues facing *facilities* that keep *crocodilians* for *exhibition purposes*. Failure to address these issues could result in adverse animal welfare and security outcomes.

Scope

These standards and guidelines apply to those people and industries responsible for the care and management of:

- *crocodilians* kept for *exhibition purposes* at *facilities*, i.e. for display, conservation, education and entertainment;
- *crocodilians* during their temporary removal from a *facility*; and
- *crocodilians* during their transport to or from a *facility*.

These standards and guidelines do not apply to:

- wild *animals* (i.e. free-living and not confined to a *facility* by an *enclosure*, a leash or by management practices);
- the keeping of *animals* solely for the purposes of feeding to other *animals* at the *facility*;
- feeding of wild *animals*;
- *animals* kept for *animal* competitions, horse racing and sporting events, wildlife farming and domestic *animal* farming;
- wildlife rehabilitation of *animals* that are not displayed to the public at the *facility*;
- *animals* at pet shops; or
- circuses and mobile exhibitors.

These standards and guidelines should be considered in conjunction with other requirements for *animals* kept for *exhibition purposes*, and related Commonwealth, state and territory legislation for:

- *animal* welfare;
- exhibiting *animals*;
- pest control; and
- nature conservation.

Where legislation requires a higher standard than these standards, the higher standard will apply.

Interpretation

- **Objective** – the intended outcome(s) of a section of the standards and guidelines.
- **Standards** – the acceptable *animal* welfare and security requirements designated in this document. They are requirements that must be met under law with respect to *animals* kept for *exhibition purposes*.

The standards are intended to be clear, essential and verifiable statements. However, not all issues are able to be well defined by scientific research or are able to be quantified. Standards use the word “must”. Non-compliance with one or more standards will constitute an offence under law.

They are presented in a box and are numbered consecutively with the prefix ‘S’.

- **Notes** – provide background and guidance on interpreting the standards and guidelines.
- **Guidelines** - complement the standards by providing advice and/or recommendations to achieve desirable *animal* welfare and security outcomes. Non-compliance with guidelines does not constitute an offence under law.

They are numbered consecutively with the prefix 'G'.

Document organisation

These *taxon standards* contain standards and guidelines that apply to the keeping of a specific *animal* group for *exhibition purposes at facilities*. They are additional to the standards and guidelines in the *Australian Animal Welfare Standards and Guidelines. Exhibited Animals – General* which apply to all *animals* kept for *exhibition purposes at facilities*.

- ***Taxon standards must always be read in conjunction with the Australian Animal Welfare Standards and Guidelines. Exhibited Animals – General.***

The *Australian Animal Welfare Standards and Guidelines. Exhibited Animals – General* contain the following sections:

- Introduction;
- Definitions;
- Responsibilities;
- Security;
- Enclosures;
- Dietary and water requirements;
- Health and wellbeing;
- Reproductive management;
- Euthanasia;
- Capture and restraint;
- Training;
- Interactive programs;
- Transportation; and
- Animal identification and records.

The same section headings are used in these *taxon standards*. An additional *taxon* preface section follows this Introduction. Where a section of these *taxon standards* does not include any standards or guidelines that are additional to those in the *Australian Animal Welfare Standards and Guidelines. Exhibited Animals – General*, the section includes the following statement: 'This section has been deliberately left blank'.

Definitions are given in the Definitions section of this document. These definitions are additional to those in *Australian Animal Welfare Standards and Guidelines. Exhibited Animals – General* that also apply to these *taxon standards* unless otherwise stated. Defined words in this document are italicised.

Taxon preface

Crocodylians

Crocodylians are semi-aquatic reptiles of the Order Crocodylia and comprise alligators, caimans, crocodiles and gharials. Globally there are more than 20 extant species in three groups (ranked as Families or Subfamilies by different taxonomists).

Two *crocodylians* are found in tropical regions of Queensland, the Northern Territory and Western Australia: the endemic freshwater crocodile *Crocodylus johnstoni*, and the estuarine crocodile *C. porosus*, which is widely distributed across the Indo-Pacific region. *Crocodylians* currently maintained in captivity in Australia also include the New Guinea crocodile *C. novaeguineae*, the Philippine crocodile *C. mindorensis* and the American Alligator *Alligator mississippiensis*. Other species may be *exhibited* in the future.

In most species of *crocodylians* there is sexual dimorphism in size – males grow faster and reach a larger size as adults. *C. porosus* is the largest living reptile, with some adult males exceeding six metres in *total length* and one tonne in weight.

Like all reptiles, *crocodylians* are ectothermic, i.e., unable to maintain a constant body temperature by physiological means. *Thermoregulation* is achieved primarily by specific heat-seeking and heat-avoiding behaviours on land and in water. *Crocodylian* activity, physiological functions and feeding occur within a narrow range of the species' preferred body temperature. Thermal behaviour of individuals is influenced by species, size, sex, feeding activity, social factors and health status.

Crocodylians are stealthy and opportunistic feeders, ambushing much of their prey at the water's edge. They are extremely powerful and capable of very fast movement over short distances. Even large *crocodylians* have the potential to propel themselves nearly vertically out of the water to a height of more than half their *total length* (to behind the back legs).

At smaller sizes their diet typically consists of insects, crustaceans, small fish and frogs, and as they grow larger they tend to consume more vertebrates including fish, turtles, birds and mammals. They are most active at night but will feed during the day. Sexual maturity is both size and age dependent. By virtue of a regular food supply, captive *crocodylians* may attain breeding size earlier than their wild counterparts, and can usually reproduce annually.

Crocodylians have complex social lives that may involve different degrees of territoriality, subtle gradations of hierarchical status, vocalisation, elaborate courting rituals and, in some species, a high degree of maternal care for the young. From 10 to more than 60 hard-shelled eggs are deposited into a nest which, depending on the species, is either a hole dug into the ground or a mound of vegetation formed by the female.

Adult males of certain species (e.g. *C. porosus*) are extremely territorial, while some other species are more gregarious and will co-exist in small groups. Larger specimens may exert social dominance over smaller animals, and low-ranking individuals may be denied access to food, water, suitable basking sites, shade or places to nest.

Successful captive management is contingent upon an understanding of *crocodylian* behaviour and ecology, provision of appropriate thermal gradients within each *enclosure*, and recognition of socio-biological considerations including those that may compromise the welfare of subordinate individuals.

Definitions

Crocodylians: all members of the Order Crocodylia including alligators, caimans, crocodiles and gharials.

Hand feed: to offer food to an *animal* from a human hand or any other part of the body without the use of an appropriate intermediate device (e.g. rod, tongs or cord) and/or a form of protected contact that will reasonably prevent any likelihood of injury to the person presenting the food.

Inhang: a continuous feature on an *enclosure* perimeter barrier, orientated towards the interior, whose angle and width provide a physical impediment to *animal* escape or as a barrier to visitor/*animal* interaction.

Total length: body length measured in a straight line from the tip of the snout to the tip of the tail. All measures of length in this document refer to a *crocodylian's total length* unless specifically stated otherwise.

All definitions cover the singular, plural and all variations of the word.

1 Responsibilities

Objective

Operators and staff understand their responsibilities and collectively manage the facility to ensure the welfare, safety and security of animals.

General

Standards

- S1.1 The *operator* must ensure demonstrations are only undertaken with *animals* selected by a *proficient keeper*.
- S1.2 The *operator* must ensure written procedures are developed and training provided for *keepers* undertaking *hand feeding* procedures.
- S1.3 The *operator* must ensure *hand feeding of crocodilians* of any size is only undertaken by *authorised keepers*.
- S1.4 All standards in *Australian Animal Welfare Standards and Guidelines. Exhibited Animals – General* relating to *dangerous animals* apply to *crocodilians* 1200 mm or longer in *total length*.

2 Security

Objective

Animals are held securely to ensure their welfare and prevent pest establishment. Access by unauthorised persons and escape of *animals* is prevented.

General

Guidelines

- G2.1 *Crocodylians* <1200 mm in *total length* may require additional security measures to prevent theft. These could include:
- i. a caretaker residing on the premises;
 - ii. security cameras; and
 - iii. secure buildings.

Endorsed

3 Enclosures

Objective

Enclosures are designed, constructed and maintained to ensure the welfare, safety and security of *animals*.

General

Standards

S3.1 The *operator* must ensure *crocodilian enclosure* barriers comply with the *enclosure* barrier specifications in Appendix 1 or are approved by the relevant *government authority* as providing equal or better containment.

Note - A range of materials and construction methods for *enclosure* barriers can be applied to confine a *crocodilian* to its *enclosure* to satisfy the requirements of S3.1, including:

- i. extending the barrier into the ground, attaching the barrier to an in-ground concrete rat-wall, or heavily compacting the substrate contiguous to the barrier;
- ii. using a variety of materials either singly or in combination, such as concrete, sheet metal, wire mesh with various apertures (e.g. weldmesh, chain link mesh, woven mesh), glass, cable, steel rods, timber and steel posts;
- iii. using inhangs and/or gussets as appropriate; and
- iv. barriers of wire mesh with specifications as per the examples provided in Appendix 1.

S3.2 The *operator* must ensure electric barriers are not used for *crocodilians*.

Guidelines

G3.1 The design of a *crocodilian enclosure* should consider the capacity of the *crocodilian* to escape by digging or pushing under or through the barrier and by climbing over the barrier.

Enclosure Furniture

Standards

S3.3 The *operator* must ensure *crocodilians* are provided with ponds and basking areas unless otherwise prescribed by a *veterinarian*.

Guidelines

G3.2 Strategically placed visual and/or physical barriers (e.g. screened fences, vegetation, semi-submerged logs, boulders, islands) on land and in water should be provided to allow subordinate individuals to withdraw from or potentially avoid aggressive interactions with conspecifics in the same or adjoining *enclosures*.

G3.3 In *crocodilian enclosures* without artificial means of managing water temperature, consideration should be given to providing ponds that exceed the minimum depth requirement, to enhance their effectiveness as thermal refuges.

G3.4 Where chemical disinfection of pond water is required, chlorine levels of 1–2 ppm have been found to be non-injurious to *crocodilians*.

Spatial Requirements

Standards

- S3.4 The *operator* must ensure each *crocodilian enclosure* provides a base minimum land area equivalent to a square with side lengths equal to the *total length* of the longest *crocodilian* in the *enclosure*. For each additional *crocodilian* the *operator* must ensure the land area is increased by 50% of the base minimum land area.
- S3.5 The *operator* must ensure each *crocodilian enclosure* provides a pond that has a base minimum water surface area equivalent to a rectangle with:
- i. a length of 2 x *total length* of the longest *crocodilian* in the *enclosure*; and
 - ii. a width of 0.5 x *total length* of the longest *crocodilian* in the *enclosure*. This width must cover the length dimension stipulated in S3.5.i.
- For each additional *crocodilian* the *operator* must ensure the water surface area is increased by 50% of the base minimum water surface area.
- S3.6 The *operator* must ensure each *crocodilian enclosure* incorporates a pond that permits each enclosed *crocodilian* to submerge to a depth where the highest point of the submerged *crocodilian* is covered by a depth of water that is at least the greater of:
- i. 200 mm; or
 - ii. 0.1 x the *total length* of the *crocodilian*.
- Exception: Where each *crocodilian* in an *enclosure* has a *total length* less than 500mm the *operator* must ensure the *enclosure* incorporates a pond that permits each enclosed *crocodilian* to submerge to a depth where the highest point of the submerged *crocodilian* is covered by at least a 100mm depth of water.

Guidelines

- G3.5 *Enclosure* and pond design should take into account future growth of the *crocodilians* (see Appendix 2).

Holding Enclosures

Standards

S3.7 The *operator* must ensure a *holding enclosure* for an individual *crocodilian* provides a minimum land area equivalent to a rectangle with:

- i. a length of 1.0 x total length of the longest crocodilian in the enclosure; and
- ii. a width of 0.5 x total length of the longest crocodilian in the enclosure. This width must cover the length dimension stipulated in S3.7.i.

For each additional crocodilian the operator must ensure the land area of the *holding enclosure* is increased by 50% of the base minimum land area required for a holding enclosure for an individual crocodilian.

S3.8 The *operator* must ensure a *holding enclosure* for an individual *crocodilian* provides a pond that has a minimum water surface area equivalent to a rectangle with:

- i. a length of 1.25 x total length of the longest crocodilian in the enclosure; and
- ii. a width of 0.5 x total length of the longest crocodilian in the enclosure. This width must cover the length dimension stipulated in S3.8.i.

For each additional crocodilian the operator must ensure the water surface area of the holding enclosure pond is increased by 50% of the base minimum water surface area required for a holding enclosure for an individual crocodilian.

S3.9 The *operator* must ensure that *holding enclosures* that do not allow effective thermoregulatory behaviours protect *crocodilians* from extremes of temperature.

4 Dietary and water requirements

Objective

Animals are provided food and water of an appropriate quality and quantity to maximise their welfare.

Food

Guidelines

- G4.1 Adequate amounts and appropriate ratios of calcium and phosphorous (for skeletal growth) and vitamins are essential for the health of *crocodilians*. These can be provided in the form of fur, feathers, bone and entrails.

Water

Standards

- S4.1 The *operator* must ensure that *crocodilian* species that are not adapted to saline conditions are not kept in saline conditions.
- S4.2 The operator must ensure that a crocodilian housed in saline conditions has access to fresh drinking water.

5 Health

Objective

The physical and psychological health of *animals* is maximised, and *disease* and *disease* transmission is prevented.

General

Standards

S5.1 The *operator* must ensure that *enclosures* for *crocodilians* provide thermal conditions that enable physiological functioning that supports good health.

Note - Although this generally requires the *crocodilian* to have regular access to an environment that enables body temperatures to reach 30-32 degrees Celsius, both daily and seasonal variation are valid.

S5.2 The *operator* must ensure that where *crocodilians* are housed without access to direct sunlight *crocodilians* are provided with:

- i. appropriate UV lighting; or
- ii. appropriate dietary supplements.

S5.3 The *operator* must ensure all *crocodilians* have appropriate opportunities to access:

- i. suitable basking sites; and
- ii. shelter, including shade.

S5.4 The *operator* must ensure that written procedures are developed, maintained and implemented to confirm equipment is functioning properly and temperatures adjusted as necessary where any artificial means of heating is required for land areas or ponds.

Guidelines

G5.1 *Crocodilians* should have access to shade over land and water.

G5.2 Mitigating risk of intimidation or injury related to social hierarchy or territoriality should be considered an integral part of appropriate housing for captive *crocodilians*.

G5.3 Hatchlings should not be exposed to stress factors such as excessively fluctuating temperatures, dehydration, noise, movement and unnecessary disturbance.

G5.4 Hatchlings should be provided with opportunities to allow natural hiding behaviours.

Enrichment

Guidelines

G5.5 *Enrichment* for *crocodilians* includes the provision of:

- i. environmental complexity to break up lines of sight;
- ii. substrates and enclosure furniture that afford different textures;
- iii. multiple options to access temperature gradients;
- iv. variety in the quantity and type of food items offered;
- v. live invertebrate prey to hatchlings and juveniles;

- vi. variation in feeding times;
- vii. age and species appropriate opportunities for social interaction with conspecifics; and
- viii. opportunities for hiding behaviours.

Endorsed

6 Reproductive management

Objective

Animal breeding is managed to maintain the genetic integrity, sustainability and/or diversity of the species, to ensure the health and welfare of breeding animals and their offspring, and to minimise production of surplus animals.

General

Standards

- | | |
|------|--|
| S6.1 | The <i>operator</i> must ensure visual barriers are erected where female <i>crocodilians</i> are nesting close to a fence in areas of public access. |
| S6.2 | The <i>operator</i> must ensure written procedures are developed, maintained and implemented to enable the collection of eggs. |
| S6.3 | The <i>operator</i> must ensure the collection of eggs is supervised by a <i>proficient keeper</i> . |
| S6.4 | The <i>operator</i> must ensure where natural incubation of eggs occurs that the <i>enclosure</i> barriers prevent escape of hatchlings. |

7 Euthanasia

Objective

If an *animal* is to be killed, it is done humanely.

General

Standards

- S7.1 Where *euthanasia* of a *crocodilian* is carried out using a firearm or a captive bolt gun, the *operator* must ensure that the spinal cord between the skull and first cervical vertebra of the *crocodilian* is severed immediately after shooting the *crocodilian*.
- S7.2 The *operator* must ensure *crocodilians* are not killed using any of the following methods:
- i. hypothermia;
 - ii. inhalation of CO₂ or gaseous anaesthetic agents; and
 - iii. decapitation without prior destruction of brain function.

Guidelines

- G7.1 Lethal injection of pentobarbitone sodium is a recommended technique for *euthanasing* small *crocodilians*.
- G7.2 Large *crocodilians* may be *euthanased* by total destruction of brain function using:
- i. a humane captive bolt pistol (in firmly secured animals); or
 - ii. an appropriate calibre bullet directly to the brain.

Note - For additional details and specific information on crocodilian euthanasia refer to: DEWHA (2009) Code of Practice on the Humane Treatment of Wild and Farmed Australian Crocodiles. First Edition, effective from 21 May 2009. Department of the Environment, Water, Heritage and the Arts, Commonwealth of Australia: Canberra, ACT.
<<http://www.adelaide.edu.au/ANZCCART/publications/Euthanasia.pdf>>

8 Capture and restraint

Objective

Animals are captured, *restrained* and herded in a manner that ensures *animal* safety and minimises negative impacts on the *animal*.

General

Standards

- S8.1 The *operator* must ensure a person securing a *crocodilian*'s jaws closed must take reasonable care that:
- i. the nostrils are not covered; and
 - ii. bands or tape are not applied so tightly as to restrict blood flow.
- S8.2 The *operator* must ensure a *crocodilian* is not lifted or carried by its limbs.

Guidelines

- G8.1 Acceptable methods of *crocodilian* capture include:
- i. hand capture or hand noose capture, if <1500 mm in total length;
 - ii. pole noose application of rope/s around the upper jaw, if >1500 mm in total length; and
 - iii. trap, if >2000 mm in total length.
- G8.2 With consideration to the size of the *crocodilian*, securing the jaws closed can be achieved with rubber bands, tape or cord placed towards the anterior end of the snout behind the nostrils.
- G8.3 Once the jaws are secured the eyes should be covered by a damp cloth to reduce visual stimulation.
- G8.4 The operator should ensure that a *crocodilian* is not captured, restrained or herded using electro immobilisation/stunning equipment except in an emergency involving a *crocodilian* that is between 1000–2400 mm in total length and the electrical immobilisation/stunning equipment used delivers a 110V charge at 400hz.
- G8.5 *Crocodilians* immobilised by electrical stunning should be physically *restrained*.

9 Training

Objective

Animal training is humane and beneficial to the *animal's* welfare.

Guidelines

- G9.1 *Crocodylians* may be habituated to accept routine husbandry procedures.
- G9.2 Irrespective of a *crocodylian's* history, it should not be assumed that any individual can be controlled solely by behavioural *restraint*.

Endorsed

10 Interactive programs

Objective

Animal welfare, safety and security are maintained during *interactive programs* so that people have a positive experience and have an enhanced appreciation of *animals*.

General

Standard

- S10.1 The *operator* must not permit visitors to *hand feed crocodilians* of any size.
- S10.2 The *operator* must ensure *interactive programs* involving *crocodilians* comply with the following:
- i. the size of the crocodilian is appropriate to the age and physical capabilities of the human participant; and
 - ii. crocodilians held by visitors must not be more than 1200 mm in total length.

Guidelines

- G10.1 The jaws of *crocodilians* may be secured closed with a band or tape during *interactive programs*.
- G10.2 An *operator* should attempt to minimise the time during which a *crocodilian's* jaws are secured by tape or band.
- G10.3 Hatchlings <500 mm in *total length* should not be used in *interactive programs*.

11 Transportation

Objective

Animal welfare, safety and security are maintained during *transport*.

General

Standards

- S11.1 The *operator* sending a *crocodilian* must ensure *crocodilians* are not subjected to temperatures below 15°C or greater than 34°C during *transport*.
- S11.2 The *operator* sending a *crocodilian* must ensure that *crocodilians* do not have their jaws secured closed if they have eaten at any time within the seven days prior to *transportation* unless a spacer has been fastened between the jaws.
- S11.3 The *operator* sending a *crocodilian* must ensure that *crocodilians* are not kept in containers or secured to tie-down boards for longer than 48 hours.
- S11.4 The *operator* sending a *crocodilian* must ensure that *crocodilians* longer than 1500 mm in *total length* are *transported* in individual containers or compartments.
- S11.5 The *operator* sending a *crocodilian* must ensure that *crocodilians* greater than 300 mm in *total length* and less than 1500 mm in *total length* have their jaws secured closed if they are *transported* in groups.
- S11.6 The *operator* sending a *crocodilian* must ensure a written description of the restraints used on each *crocodilian* greater than 1500 mm in *total length* is placed in a prominent position on the outside of the container, preceded by the phrase "IMPORTANT – *crocodilians* in *transport*".

Guidelines

- G11.1 Access to *crocodilians* >1200 mm in *total length* enclosed in containers should be from both ends of the container.
- G11.2 A number of methods are suitable for *transporting crocodilians*, including:
- i. inside individual calico or hessian bags, placed within a container or crate, if <1500 mm in total length (such bags should have their seams on the outside, to prevent animals from becoming entangled in threads);
 - ii. containers or crates appropriate for the size of the *crocodilian*; and
 - iii. secured to a tie-down board, if >1200 mm in total length.
- G11.3 Ideally, ambient temperature in and around *crocodilian* containers during *transport* should be maintained between 24–32°C.
- G11.4 *Crocodilians* should have their vision restricted during *transport*.
- G11.5 If a spacer is required to be fastened between the jaws during *transport*, with consideration to the size of the *crocodilian* suitable materials may include a:
- i. piece of thick rope;
 - ii. length of rubber pipe; or
 - iii. smooth block of wood.
- G11.6 Padding should be placed between any crates, containers or tie-down boards and the body of a *vehicle* if *transport* will involve bumpy roads.

- G11.7 Sedation should only be used when a *veterinarian* or *proficient keeper* believes the *crocodilian's* size or temperament is a threat to the safety of the *animal* and/or other *crocodilians*.

Endorsed

12 Animal identification and records

Objective

Animal identification methods and *animal* records enable monitoring of welfare of *animal* collections and inform approved management programs.

Animal Identification

Standards

S12.1 The *operator* must ensure exotic *crocodilians* and *crocodilians* used in *interactive programs*, other than those involving feeding, have *individual permanent identification*. All other *crocodilians* are exempt.

Guidelines

- G12.1 All *crocodilians* should have *individual permanent identification*.
- G12.2 A passive integrated transponder (PIT) is the recommended form of *individual permanent identification* for *crocodilians*.
- G12.3 The standard location for PIT insertion in *crocodilians* is on the left side, anterior to the nuchal cluster or the left hind leg.
- G12.4 *Crocodilians* may be managed as *group animals*.

Records

Guidelines

- G12.5 The dates and results of any pond water quality testing undertaken should be recorded and maintained.

Appendix 1

Crocodilian enclosure barrier specifications

The following tables address containment. Heights are measured on the internal face of the barriers.

unclimbable barriers¹	
<i>crocodilian total length</i> (mm)	minimum unclimbable internal barrier height (mm)
<500	500
500 – 800	800
>800 – 1500	1000
>1500 – 4000	1400
>4000	1200

other² barriers					
<i>crocodilian total length</i> (mm)	minimum climbable internal barrier height with <i>inhang</i> (mm)		minimum climbable internal barrier height without <i>inhang</i> (mm)	minimum wire mesh diameter (mm)	maximum mesh aperture (mm)
	barrier	<i>inhang</i>			
<500	500	150	n/a	1.0	10 x 20
500 – 800	800	200	n/a	1.5	25 x 50
>800 – 1500	1000	250	1300	2.0	50 x 50
>1500 – 4000	1200	300	1500	2.0	50 x 50
>4000	1000	400	1200	2.5	60 x 60

¹ Examples of materials that may be used to create unclimbable barriers are glass, timber, sheet iron, metal bars, pool fencing, concrete mock-rock, brick and small aperture wire mesh. These may be used in combination to create an unclimbable barrier. Typically the barrier would be near to vertical.

² Examples of materials that may create other barriers are wire mesh with various apertures and concrete mock-rock that does not present a near to vertical face.

Appendix 2

Maximum size, breeding size and type of nest for selected *crocodilians*

Maximum size and breeding size refer to *total length* (metres) of males (M) and females (F). These should be regarded as nominal figures (for guidance) rather than absolute limits.

Type of nest is abbreviated Mnd (mound) or Hol (hole).

Species	Common name	Maximum size (m)		Breeding size (m)		Nest type
		M	F	M	F	
FAMILY Alligatoridae						
<i>Alligator mississippiensis</i>	American alligator	4–5	≤2.8	≥1.9	≥1.8	Mnd
FAMILY Crocodylidae						
<i>Crocodylus johnstoni</i>	freshwater crocodile	≤3.0	≤2.1	>1.2	>1.0	Hol
<i>Crocodylus novaeguineae</i>	New Guinea crocodile	≤4.0	≤2.7	≥2.0	≥1.8	Mnd
<i>Crocodylus mindorensis</i>	Philippine crocodile	≤3.0	2.7	1.6	1.5	Mnd
<i>Crocodylus porosus</i>	estuarine crocodile	5–6	3–4	≥3.1	≥2.1	Mnd
<i>Tomistoma schlegelii</i>	false gharial	4–5			≥2.5	Mnd
FAMILY Gavialidae						
<i>Gavialis gangeticus</i>	gharial	≤6.5	>4.0	≥3.0	≥2.6	Hol

Note - American alligators of 5–6 m in *total length* have been recorded in the past, but a 4 m in *total length* adult male is now considered large; social interaction between conspecifics tends to prevent breeding until male *A. mississippiensis* reach 2.4–2.8 m in *total length*.

Although some specimens of the estuarine crocodile are known to have exceeded 6 m in total length, adult males are typically between 4–5 m in total length; a captive *C. porosus* housed in Florida reportedly reached 5.5 m in total length.