

## Humane Euthanasia/Killing Methods for Crocodilians - An Update

The issue of humane welfare, including slaughter/killing, of crocodilians, is of critical importance for the global crocodilian farming industry, and has been discussed and addressed by the CSG at various times over the last 30 years in order to safeguard the industry by continuing to meet contemporary animal welfare standards. Also to this end, wildlife agencies, farms, fashion houses, etc., have developed various codes of practice and standard operating procedures. Some key actions involved with the development of crocodilian welfare and humane slaughter guidelines, include:

- 1992 Hutton (1992) addresses slaughter methods on farms, and recommends further research to ensure methods are humane. This was largely in response to “ludicrous” animal rights claims that crocodiles were being skinned alive and vertebrae broken to prevent crocodiles injuring handlers.
- 2009 Australia develops a Code of Practice for the Humane Treatment of Wild and Farmed Australian Crocodiles (NRMMC 2009).
- 2011 Swiss Government assembles an Expert Panel (including CSG members Paolo Martelli, Charlie Manolis, Javier Nevarez, Tomas Waller and Don Ashley) to review and develop guidelines for humane slaughter of reptiles (Expert Panel 2013), to be submitted to the World Organisation for Animal Health (see below).
- 2011 Louisiana develops Best Management Practices for Louisiana Alligator Farming (LDWF and LSU 2011).
- 2012 Zimbabwe develops a Code of Practice, based to a large extent on the Australian Code (CFAZ 2012).
- 2012 CSG Veterinary Science Group summarizes acceptable crocodilian slaughter methods for the CSG website (under Veterinary Science Resources).
- 2013 Zambia develops Code of Practice (ZaCFA 2013).
- 2014 South Africa develops standards for captive crocodiles (SABS 2014).
- 2015 CSG develops Best Management Practices for Crocodilian Farming, which included methods for humane slaughter (Manolis and Webb 2015).
- 2016 Thailand legislation incorporates standards for crocodiles (ACFS 2016).
- 2014-19 Fashion houses develop their own internal standards for welfare of farmed crocodilians.
- 2019 Recommendations of the World Organisation for Animal Health (OIE) directly address the need to ensure the welfare of chelonians, crocodilians, lacertilians and ophidians, during the process of killing for skins, meat and other products (OIE 2019), with CSG members contributing.
- 2020 American Veterinary Medicine Association (AVMA) publishes guidelines for euthanasia of animals (2020 edition). AVMA (2020) states that “*While some euthanasia methods may be utilized in slaughter (which refers to humane killing of animals destined for human consumption) or harvest and depopulation, recommendations related to humane slaughter and depopulation fall outside the purview of the Guidelines*”.

This document updates the current status of humane methods for the slaughter/killing of crocodilians that are considered “best practice” and/or “acceptable”. In doing so, the CSG Veterinary Science Group recognizes that certain methods (eg shooting) may not be suitable in some contexts, and that recommended methods are not intended to override the national legislation of different countries. The methods outlined here apply to crocodilians in zoos and farms, and not to wild harvesting, particularly where indigenous people are involved (traditional harvesting/hunting).

We also recognize that research may lead to the development of new and/or improved methods (eg Nevarez *et al.* 2014), and so methods that are not mentioned here should not be automatically considered as being acceptable or unacceptable.

**Best Practice:** achieving rapid death without stress or pain. It is accepted that painful stimuli will take 0.2 seconds to reach the brain and be perceived as pain by the brain. Therefore trauma leading to death must achieve destruction of the brain in less than 0.2 seconds. Where that is not possible, the animal should be rendered unconscious first.

Acceptable methods of slaughter/euthanasia (Table 1) are in harmony with published documents, with the notable exceptions of use of carbon dioxide and flash freezing, which are considered acceptable only by the American Veterinary Medical Association (AVMA 2020), but which are considered unacceptable by most other sources (eg OIE 2019).

The following methods are considered unacceptable for the slaughter/euthanasia of crocodilians:

- Exsanguination
- Freezing or cooling
- Heating or boiling
- Suffocation or drowning

- Inflation using compressed gas or liquid
- Live evisceration or skinning
- Constriction bands to induce cardiac arrest
- Inhalation of asphyxiating gases (carbon dioxide, carbon monoxide or nitrogen)
- Use of neuromuscular blocking drugs alone
- Cervical dislocation, decapitation or cord severance without pithing

Some of these unacceptable methods may still be encountered, and it is recommended that they should cease to be used.

Table 1. Acceptable methods of slaughter/euthanasia for crocodylians based on current knowledge.

---

**Captive Bolt (penetrating or non-penetrating):** Immobilization is required, manual or electric. Although not required, pithing is often performed after animal has been killed.

**Shooting (free bullets):** Immobilization is sometimes required before shooting. There is higher risk to the operator and higher risk of failure. Although not required, pithing is often performed after the animal has been killed.

**Percussive blow to the head:** Immobilization is required, manual or electric. Not practical for crocodylians larger than 3 kg, or for large numbers of crocodylians. There is higher risk for operator and higher risk of failure.

**Spinal cord severance immediately followed by pithing (including decapitation for very small individuals):** This is the most common method; Immobilization is required, manual or electric. Electric immobilization appears to also produce loss of consciousness and is recommended.

**Chemical agents:** Immobilization is required, manual or electric. Rarely employed in the crocodylian farming industry.

---

#### Literature Cited

- ACFS (The National Bureau of Agricultural Commodity and Food Standards) (2016). The Agricultural Standard, TAS 7700-2016, Crocodile Farming. Ministry of Agriculture and Cooperatives: Bangkok, Thailand. (in Thai only).
- AVMA (2020). AVMA Guidelines for the Euthanasia of Animals: 2020 Edition.
- CFAZ (Crocodile Farmers Association of Zimbabwe) (2012). Codes of Practice. CFAZ: Harare.
- CSG Veterinary Science Group (2012). Humane euthanasia/killing methods for crocodylians.
- Expert Panel (2013). Analysis of Humane Killing Methods for Reptiles in the Skin Trade, ed. by Swiss Federal Veterinary Office. Swiss Federal Veterinary Office: Berne, Switzerland.
- LDWF and LSU (Louisiana Department of Wildlife and Fisheries and Louisiana State University) (2011). Best Management Practices for Louisiana Alligator Farming. LDWF and LSU: Louisiana, USA.
- Hutton, J.M. (1992). Humane killing of crocodylians. Pp. 194-196 *in* Crocodiles. Proceedings of the 11th Working Meeting of the IUCN-SSC Crocodile Specialist Group. IUCN: Gland.
- Manolis, S.C. and Webb, G.J.W. (compilers) (2016). Best Management Practices for Crocodylian Farming. Crocodile Specialist Group: Darwin, Australia.
- Nevarez, J.G., Strain, G.M., Da Cunha, A.F. and Beaufrère, H. (2014). Evaluation of four methods for inducing death during slaughter of American alligators (*Alligator mississippiensis*). American Journal of Veterinary Research 75(6): 536-543.
- NRMMC (National Resource Management Ministerial Council) (2009). Code of Practice for the Humane Treatment of Wild and Captive Australian Crocodiles. NRMMC: Canberra.

OIE (2019). Killing reptiles for their skins, meat and other products. Chapter 7.14 *in* OIE Terrestrial Health Code. OIE: Paris.

SABS Standards Division (2014). South African National Standard: Crocodiles in Captivity. SABS Standards Division: Pretoria.

ZaCFA (Zambia Crocodile Farmers Association) (2013). Draft Code of Practice. Prepared by Zambia Crocodile Farmers Association in conjunction with the Zambia Wildlife Authority. Unpublished.

-----

**Cite article as:**

Martelli, P., Shilton, C. and Manolis, C. (2020). Humane Euthanasia/Killing Methods for Crocodilians - An Update. Crocodile Specialist Group Newsletter 39(1): 6-8.