The Nile crocodile - the first slaughter in Europe?

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Abstract

Crocodiles reared on farms in the Czech Republic, with the exception of crocodiles kept in zoological gardens and crocodiles kept for other special-interest non-commercial purposes, can be used for commercial and gastronomic purposes. This is consistent with the current trend of globalisation and demand for exotic foods. Their processing must, however, be resolved in legislative terms from the viewpoint of both consumer safety and animal welfare. To obtain meat and animal products of good quality, it is also necessary to ensure that slaughterhouses are appropriately equipped and that Good Making/Hygiene Practices (GMP/GHP) and Hazard Analysis and Critical Control Points (HACCP) procedures are observed.

Farmed crocodile, microbial contamination, slaughter, veterinary meat inspection

Introduction

The legislative requirements

The legislation for the slaughter of crocodiles was laid out in the provisions of Section 21, para. 15, Section 22, para. 1 k), Section 23, para. 4 and Section 24, para. 2 of the Czech Act no 166/1999 as amended. Decree no 34/2013 on veterinary requirements for the slaughter of crocodiles and the processing of meat and other products from crocodiles stipulates, further conditions and obligations. This executive regulation (Decree no 34/2013), which was the first crocodile slaughter regulation to be approved by the European Commission, makes it possible for crocodiles to be processed as animals for slaughter at slaughterhouses without specific approval so long as the given slaughterhouse meets the basic requirements for animal slaughter, including the slaughter of farmed crocodiles, in structural, technical and organisational terms, including its staffing and administration. The given conditions tend to be met by red-meat slaughterhouses rather than the poultry slaughterhouses previously considered in view of the specific requirements for the observation of animal welfare and the safety of persons involved in the handling of animals, i.e. trapping, stunning and bleeding.

Characteristics of a farm rearing and slaughter

The former management of the agricultural cooperative Agrodružstvo Jevišovice established a crocodile farm on a farm in Velký Karlov, the first of its kind in Central Europe. Their plan was to extend it to the construction of an agricultural tourism site with a crocodile farm in Velký Karlov, which was also to include a local zoological garden (sheep, goats, calves, donkeys, ponies, lamas, ostriches, camels and moufflons), crocodile rearing with enclosures, stables and an indoor riding school, a breeding pond and a forest park. The first fifty Nile crocodiles were brought to the farm from France in August 2004 at the age of ten days. A second group of two hundred crocodiles was brought to Velký Karlov from Thailand in 2006 at the age of three to four months and a length of 35 – 50 cm. Crocodiles were raised in Velký Karlov farm and in Jevišovice, where“Croco-terrarium” housing between thirty and forty crocodiles was built in 2011 (Plate VI, Fig. 1).

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The number of crocodiles was 31 older crocodiles imported from France and 155 younger crocodiles imported from Thailand in August 2013. All the crocodiles were fitted with chips. The longest of these crocodiles measured around 335 cm. Those crocodiles were fed by 2–5 chickens once or twice a week. The chickens for feeding came, in all cases, from a flock destined for a slaughter at the given time, with sub-standard chickens and chickens of non-standard weight. These chickens were killed by CO_2 in an approved manner at a facility at the farm, bled, skinned and gutted. The crocodiles were fed by fresh chickens if these were available; if not, then frozen chickens were used. The Jevišovice farm was registered for the slaughter of crocodiles by stunning and bleeding on the basis of an application in 2013.

Crocodiles were transported from Velký Karlov in transport crates following trapping, chip identification and sexing. These crates provided an adequate level of comfort for the crocodiles during transport, while also enabling handling safety for members of staff. The crates were secured against the escape of animals and fitted with air ducts ensuring air ventilation. Transportation period did not exceed one hour. The crocodiles were subsequently placed in the "Croco-terrarium" or in a pre-slaughter holding section. Crocodiles of a length of more than two metres and a weight of more than 50 kg were slaughtered. The length of the animal gave an indication of the size of the cuts of meat with the highest quality for culinary purposes.

The pre-slaughter section of the "Croco-terrarium" was adapted for crocodiles destined for a slaughter and was comprised of a small pool and an area of dry land. Crocodiles spent between five and ten days there. The breeder sent food-chain information about the poultry used for feeding and food-chain information about the crocodiles designated for slaughter to the pertinent veterinary administration at least 24 hours before slaughter. The crocodiles were caught by head in a special noose attached to a strong pole (Plate VI, Fig. 2).

The crocodile escape reflex involves the animal rotating around its longitudinal axis. The noose rotates with the crocodile so that the noose does not become wound up or torn. The crocodile is pulled onto dry land and immobilised by means of the physical fixation of its tail, followed by fixation of the body and jaws by them being pushed downwards onto a mat.

For larger animals, it is suggested that one or more snout ropes be placed over the top jaw behind the largest teeth, to secure the animal, and after closing the jaws, cord or tape is tied around both jaws. As soon as the jaws are secured, the eyes should be covered to reduce visual stimulation, before additional tying is carried out. This can be achieved with a wet sack (hessian bag), cotton wool pad or moistened crepe, taped to the head to avoid it being shaken off by the crocodile (Code of Practice approved by the Ministerial Council of the Australian Government 2009).

Stunning and bleeding were performed by professionally competent members of slaughterhouse staff trained in the slaughtering of crocodiles. Stunning was performed with a captive bolt pistol in the centre of the skull around 5 cm above a line connecting the eyes. The entire process from catching the crocodile in a noose to stunning took place in a matter of seconds, generally not exceeding 40 seconds. This period was extremely important to avoid pre-slaughter stress and to reduce the risk of pre-slaughter and slaughter septicaemia. The stunned crocodile was transported to the bleeding room where bleeding was performed by means of a cut between the skull and the first cervical vertebra. The crocodile was hung head down so that all fluids, blood and rinse water was caught in a vessel for secondary animal products. The crocodile was identified by its chip number and its skin was then rinsed with drinking water. Lactic acid at a concentration of 2% was applied to the skin before transport. The crocodile carcass was hung in a van. The transport space was pre-cooled to the temperature between -7 and -5 °C.

Crocodile carcass processing

Processing of the carcasses of slaughtered crocodiles took place in dedicated areas of the slaughterhouse and only during the days on which no other livestock animal was

slaughtered or other material was processed at the slaughterhouse. Individual carcasses were identified by their chip number, measured and weighed before the processing begun. Carcass processing took place in one of two ways depending on the requirements of the owner of the animals or requirements for the further processing of the skin for leather or taxidermy. Their further processing took place in either a hanging or lying position. The slaughterhouse operator washed the crocodile carcasses with a stream of lukewarm drinking water and subsequently treated the skin by spraying it with a 2% solution of lactic acid, without any contact with the meat. Great emphasis was placed on ensuring that the external surface of the crocodile skin does not come into the contact with the muscle surface when the crocodile has been skinned in view of the fact that contamination of the meat by bacteria of the genus *Salmonella* spp. represents the greatest biological risk. The crocodiles were skinned before evisceration if skinning has started on the back for the production of leather or after evisceration if the skin was destined for taxidermy (Plate VII, Fig. 3 and 4).

In either case, it was strictly required to eviscerate without unnecessary delay. The organs and digestive tract were removed from the carcass are submitted for the veterinary inspection. The chilling of the carcass begun as soon as possible in order that the crocodile meat attains a temperature of no more than 4 °C within 24 hours of slaughter. The crocodile carcasses were hung in a designated cold store until the following day. They were cut into sections, taken to a packer for vacuum packaging and after frozen (Plate VIII, Fig. 5).

Each package was labelled with the number of the animal or production batch, date of slaughter, date of butchering and date of minimum shelf life. Muscle tissue was taken from the tail, the legs, the jowl and the back. All parts of the carcass were identified in order that they may be assigned to the corresponding carcass when the results of the laboratory tests and the ruling from the official veterinary inspector were received. In view of the fact that the organs were considered, in accordance with the Decree no 34/2013, unfitted for human consumption, they were classed as a category of material no 2 with a view to the Article 7 of the Regulation (EC) no 178/2002 of the European Parliament and of the Council.

Materials and Methods

Ante mortem veterinary inspection

Ante mortem veterinary inspection included inspection of food-chain information on feed and food-chain information on the crocodiles, and the evaluation of operational and personal hygiene before the commencement, during and after the slaughter. Inspection was performed before slaughter, with a particular view to any injuries and the behaviour of the animals, and monitoring of welfare during slaughter and bleeding was conducted. The official veterinary inspector sent the record card on the crocodile, a slaughter report and his findings on the animal for slaughter as information for a veterinary monitoring at the slaughterhouse as the site of further processing and completion of a ruling on the meat.

Post-mortem veterinary inspection

Before the veterinary meat inspection itself at the slaughterhouse, the official veterinary inspector took receipt of the food-chain information and veterinary certificate and verified the identity of individual carcasses by recording the chip number with a reader. Then the nutritional status, colour, smell and symmetry of the carcass and its sufficient bleeding were assessed. The signs of the application of medicines, injuries, and for any abnormalities in the muscle tissue and organs that might guide the further course of the inspection were observed. After the external surface inspection of the carcass and a visual inspection of the head, an inspection of the muscle tissue and organs was performed (Plate VIII, Fig. 6)

If necessary, the official veterinary inspector, in addition to a visual and tactile examination, also performed incisions into any parts of the carcass and the organs of the thoracic and abdominal cavities that appeared to be altered, and possibly performed auxiliary texts. Also, he took samples for the laboratory examination for the purpose of evaluating and ruling on whether the crocodile meat is edible or not. Meat that passed as fit for human consumption has been marked with the imprint of the stamp “CZ 333”. Meat that was deemed unfit for human consumption has been marked with the imprint of a stamp of a triangular shape, in addition to being defaced by deep incisions into the tissue or by being marked with a dye.

Sampling for the laboratory tests

1. Parasitological tests:

A sample for testing for the presence of *Trichinella* spp. parasites was taken from every carcass in accordance with the Commission Regulation (EC) no. 2075/2005 and was sent to the State Veterinary Institute in Jihlava for testing by the digestion method. Samples for other tests (*Spirometra, Pentastomida, Anisakis*) were always taken on the basis of post-slaughter examinations ordered by the official veterinary surgeon.

2. Microbiological tests:

Samples were taken from the carcasses of all crocodiles for testing for bacteria *Salmonella* spp. (0/25 g^{-1}). Samples for testing *Aeromonas hydrophila* (0/25 g^{-1}) were taken on the basis of a ruling by the official veterinary inspector; generally one sample per slaughter day.

3. Residues of antibiotics and other inhibitory substances:

Testing focused on the antibiotics most frequently used to treat crocodiles on crocodile farms and on poultry farms as a part of the crocodile food chain. Tests focused on the presence determination of residues of inhibitory substances – common antibiotics – including tetracycline and sulphonamide.

4. Chemical tests:

Testing focused on the anthelmintics most commonly used and anthelmintics used in poultry as a part of the crocodile food chain – particularly anticoccidials.

5. Other tests:

According to the ruling of the official veterinary inspector on the basis of post mortem inspection, e.g. pathological-anatomical, histological, including staining or typing.

Results and Discussion

The results of the tests performed on the crocodiles slaughtered (17 individuals) weighing 38 – 82 kg and of a length of 225 – 325 cm, at the age of between 6 and 8 years, did not show the presence of residues of inhibitory substances (common antibiotics), including tetracycline, sulphonamide, anthelmintics and anticoccidials. It can be assumed that there are no problems of this kind on farms.

Salmonella spp. is considered the most relevant bacterial hazard that may occur in reptile meat. Studies about salmonellae in crocodiles are few, but report consistently on the very common occurrence of a great number of serotypes in clinically healthy farmed as well as in wild crocodiles (EFSA 2007). Serotype distribution showed a great variety of serovars within *Salmonella enterica* subspecies *enterica, salamae* and *diarizonae*. Although many of these serotypes may be considered as types rarely or never associated with human disease, it should be emphasized that 40% or more of isolates belong to subsp. *enterica*, which comprises members potentially pathogenic to man, e.g. *S. Typhimurium* (EFSA 2007). *Salmonella* spp. was confirmed in only one of 17 crocodiles tested at the State Veterinary Institute – this was the non-invasive serovar *Salmonella enterica subsp. arizonae.*

Samples of organs were also collected in view of pathological-anatomical findings made during post-slaughter examinations. Typing was performed on samples in which tests had demonstrated the presence of mycobacteria or confirmed tuberculosis changes to parenchymatous organs. Atypical mycobacteria (*M. terrae, M. szulgai*) were confirmed. Five crocodiles were declared unfit for human consumption on the basis of these findings. All parasitological tests were negative.

Conclusions

Handling crocodiles is considerably more risky than the normal slaughter of livestock from the viewpoint of veterinary supervision. Care must be paid to speed and minimum pain and suffering in the capture of crocodiles, their immediate stunning, bleeding and subsequent further operations to process the carcass with the aim of obtaining high-quality material and ensuring successful valorisation of the animals slaughtered.

The operator has an interest in utilising all products from the slaughter of the crocodiles, first and foremost the meat and the skin. In addition to the most valuable parts (tail and back fillet), efforts are also made to utilise other parts (the jowl, neck, meat from the limbs

and ribs). The yield of meat on the bone is 50 – 60%, of meat off the bone up to 40%. In view of the considerable costs involved, the price of the end products is high, for which reason crocodile meat is not, as yet, distributed through the retail network, but is offered exclusively in selected restaurants.

The skin is highly valued, and can be used in the production of luxury leather accessories and for taxidermy exhibits.

References

Act no 166/1999 On the veterinary care and amending certain related laws 1999: Collection of Czech laws **57**: 3122-3150

Decree no 34/2013 On the veterinary requirements for the slaughter of crocodiles and the processing of meat and other products from crocodiles 2013: Collection of Czech laws **16**: 236-242

EFSA 2007: Scientific Opinion on the public health risks involved in the human consumption of reptile meat. The EFSA Journal **587**: 15-16

Natural Resource Management Ministerial Council 2009: Code of practice on the humane treatment of wild and farmed Australian crocodiles, Australian Government, 23p

Velecký J, Coufalová J, Tuček M, Ševčík J, Kolářová H 2013: The Nile crocodile – the first slaughter in Europe? The food hygiene and technology conference: XLIII. Lenfeldovy a Höklovy days at the University of Veterinary and Pharmaceutical Sciences Brno, Summary of posters and lectures: 76 p

Fig. 1. Jevišovice “Croco-terrarium” with a pre-slaughter holding area

Fig. 2. Catching a crocodile in a noose

Fig. 3. Skinning for leather production

Fig. 4. Processing for the purpose of taxidermy – state after evisceration

Fig. 5. Dressed crocodile carcass

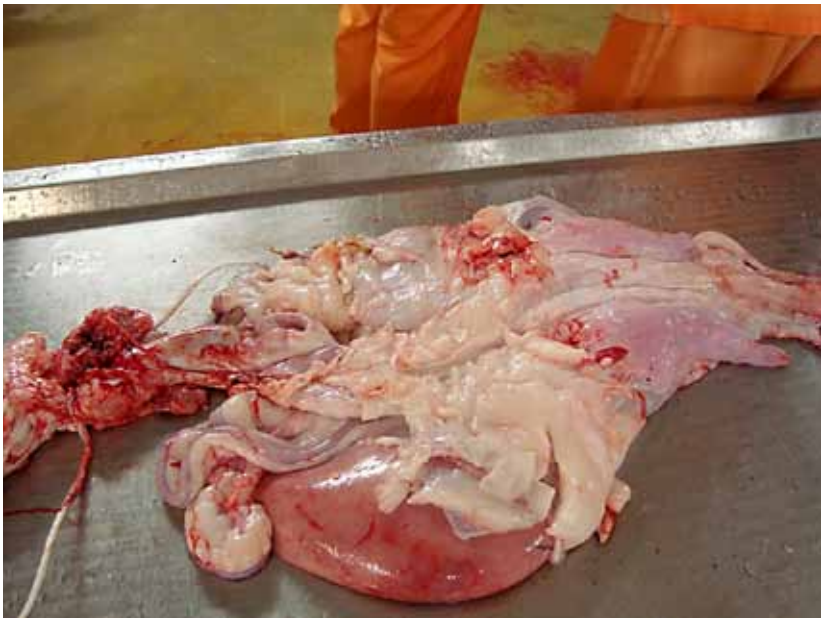

Fig. 6. Removed organs and digestive tract in their natural context