

Management and Care of Captive Asian Elephant Bulls in Musth

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Introduction

Of all the challenges facing captive elephant owners/managers in Asia today, none may be greater than those related to how to properly care for musth bulls. Musth is the physical and behavioural manifestation of physiological changes that include temporal swelling, temporal gland secretion (TGS), urine dribbling, and elevated testosterone (see review, Brown 2014). Behavioural changes include increased aggression and reduced obedience, making them more difficult to control. There are legitimate concerns about poor welfare of musth bulls (see Fig. 1). Restraint by short tethers, social isolation, and lack of access to fresh food and clean water exacerbate frustration and aggressive behaviours. Repetitive behaviours, such as rocking and swaying, often develop in elephants under such restricted containment.

Thus, a set of guidelines has been created by the Asian Elephant Specialist Group (AsESG) to help facilities with Asian elephants ensure proper management that meets elephant welfare needs while protecting people. This paper provides an overview of the biology of musth in Asian elephants and factors affecting musth status, and summarizes the guidelines put forth by the AsESG.

Signs of musth

The intensity and duration of musth, and associated aggression, can vary considerably among bulls (e.g. Lincoln & Ratnasooriya 1996; Brown 2014). While some bulls are manageable during musth, others are not. So, it is important to recognize the signs of musth, which can be broken down into definable stages:

Pre musth

The temporal glands begin to swell, appetite is reduced, and the bull may display frequent penile erections and masturbation. Testosterone concentrations are slightly elevated over baseline. Behavioural changes can include occasional defiance to mahout commands. They may seek out females, sniff the urogenital area, and display flehmen. They may also check the genitals of other bulls to exert dominance.

Early musth

Characterized by more TGS, which becomes odorous as the period progresses. Behaviour becomes increasingly aggressive and erratic, and a bull may become unresponsive to commands.

Full musth

Temporal glands secrete a thick tar-like fluid, and urine dribbling is continuous. Androgen concentrations increase significantly (10–20 times baseline) and many, though not all, males become more disobedient, unpredictable and highly aggressive. A bull in musth will exercise dominance over other adult males, and some may become overly aggressive with females.

Post musth

Presence and staining of dried TGS on the face and urine on the rear legs is still evident. The bull may be in poorer condition due to reduced feed intake (human or self-induced). Physical and behavioural activity generally return to baseline; however, many bulls are still very dangerous in the 2 weeks after musth signs disappear, when testosterone is declining.

Factors associated with musth

Age

In the wild, musth occurs in sexually mature bulls, generally those over 25 years of age. However, in elephants under human care, it can occur in those as young as 7 years old.

Season

Bulls generally exhibit musth annually, and often at the same time each year making it possible to predict time of onset in many bulls. In Asian range countries, musth generally occurs between October and February and lasts for 1-2 months. However, some bulls exhibit musth more than once a year with highly variable and unpredictable patterns.

Diet and body condition

Consumption of highly nutritious or caloric foods (e.g. grains, bananas, sugar cane) and maintaining a high body condition can prolong or intensify musth.

Activity

Bulls are more prone to entering musth if they have a sedentary life style, are not engaged in daily physical activities, or are offered rest after a strenuous work period (e.g. logging season).

Social conditions

Musth can be moderated by social dominance status. In younger bulls, it can be suppressed by older, more socially dominant bulls. Groups of bulls may show asynchronous musth periods, with dominant males coming into musth first. It can also be triggered by oestrous females.

General guidelines

The management of musth bulls in Asia has remained largely unchanged for centuries. Traditional methods often involve tethering to trees or posts with short ropes or chains, or hobbles, and often in areas with little shade or

water, and are considered inhumane. Restriction of water during musth is dangerous because of increased fluid loss due to urine dribbling and TGS, which can result in kidney damage. Food intake is sometimes restricted based on the assumption that this will terminate musth sooner. Aggressive bulls may be difficult to approach, which can result in a lack of hygiene on its keeping ground, leading to health problems such as foot rot and high parasitic infestation. Managers of musth bulls must be willing to invest in resources and facilities to ensure the safety and welfare needs of both animals and humans. The following are recommended guidelines for proper musth bull management, although actual practices should be take individual elephant temperament into consideration.

1. Identify all prospective musth candidates and keep a written record of all musth activity (e.g. use a musth log) to predict future musth episodes. Musth records should

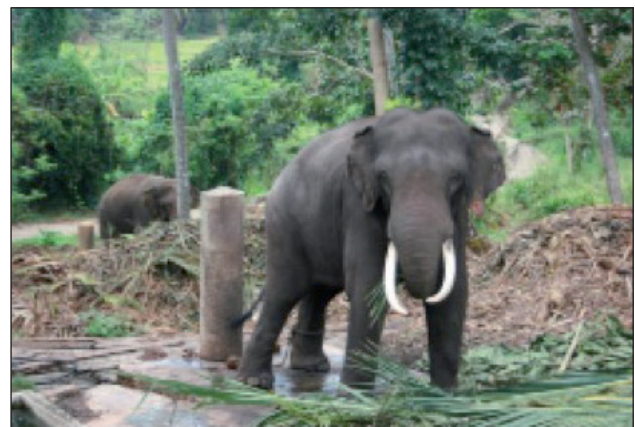


Figure1. Examples of inadequate management of musth bulls indicating lack of shade and/or short chains. Photos courtesy of Sri Lanka Wildlife Conservation Society.

include: age of first musth if known, dates of musth, duration of musth, intensity of musth signs, severity of aggression, injuries to staff or other elephants, and if mitigating actions were taken (drugs, isolation, etc.). Records should be computerized and transferred when a bull changes ownership.

2. Mahouts should receive adequate training in elephant handling, including using positive training/handling techniques. A chief mahout should be appointed who can ensure that all mahouts at a facility follow proper guidelines.
3. Facilities should have an isolated area where musth bulls can be safely maintained. Ideal options for musth bull containment are:
 - a. Long chain in a forested area with water, natural forage, and shade (recommended, 20–30 m chains).
 - b. Electrified paddock (recommended 12 x 12 m).
 - c. Steel enclosure with natural substrate (recommended 12 x 12 m).
 - d. Large paddock with access to water and shade, with opportunities to socialize with other elephants if possible.
4. During the daytime, the living area should have shade, either by forest canopy or a well-constructed roof.
5. Elephant resting areas (day and night) should be cleaned of faeces and urine daily; faeces should be stored/disposed of away from the elephant (composting of faeces is recommended).
6. As the bull enters musth, provisioning of concentrated rations and high calorie foods (e.g., grains, bananas, sugar cane, etc.) should be limited; instead feed primarily fodder (e.g., napier grass, cornstalks, etc.), with access to drinking water. Bulls should not be over-conditioned, and fed to maintain a body condition score of 2.5–3 (1–5 scale) or 5 (1–11 scale). Withholding food and water to lower body condition as a means of reducing musth symptoms should not be allowed.
7. Bulls should have an annual veterinary exam.
8. Facilities should have an on-site veterinarian or an agreement with nearby veterinarians or elephant hospital for medical or emergency

services.

9. For public venues, there must be signs in at least two languages (local + English) to warn staff and visitors about the musth-reserved area.
10. Facilities should have a written emergency/aggression management plan and equipment (e.g. gun, blow pipe) for uncon-trollable musth bulls, following a protocol whereby the least amount of force is used and equipment (chains, ankus) is not misused.

Mitigation of musth

Drugs and other pharmaceuticals can diminish musth symptoms and control aggressive behaviour for variable lengths of time. These affect neural function or act on the hypothalamo-pituitary-gonadal (HPG) axis to reduce androgen production and potentially ease a bull out of musth, thus making it more manageable. Sedatives may calm bulls, while other drugs have been shown to suppress the HPG axis or block testosterone action (e.g., anti-androgens, GnRH analogs, GnRH vaccines). However, reduced testosterone concentration or function does not guarantee alleviation of aggressive behaviours, or that a bull is safe to work with.

It is important to note that musth is a natural phenomenon in adult bulls and chemically suppressing it is not normal. It also is vital that musth-suppressing treatments only be used when the welfare of the bull or human safety is in question, and not for routine control of aggression. Chemical treatment should never replace good management. Many of these drugs have not been fully tested in elephants. It also is not known what the long-term consequences of these treatments are. Finally, because behaviour can be unpredictable, precautions for handling musth bulls should be followed even if they are being treated and show reductions in testosterone.

Short-term treatments to diminish musth symptoms

- a. Sedatives
 - i. Xylazine
- b. Antipsychotics/anti-anxiety

- i. Haloperidol (antipsychotic, may reduce agitation)
- ii. Diazepam (benzodiazepine, anti-anxiety)
- iii. Trilafon (dose and efficacy undetermined)
- iv. Zuclopenthixol (dose and efficacy undetermined)
- c. Antiandrogens
 - i. Flutamide
 - ii. Cyproterone acetate
- d. GnRH analogs
 - i. Detirelix (GnRH antagonist)
 - ii. Degarelix acetate (GnRH antagonist, Gonax®)
 - iii. Leuprolide acetate (GnRH agonist, Lupron®)
- e. Steroids
 - i. Synthetic progestagens [e.g., medroxyprogesterone acetate (i.e., Depo-Provera)]

Long-term methods to prevent or suppress musth

GnRH vaccines (e.g., Improvac®, Improvest®) have shown promise in controlling reproductive and sex-related behaviours that are testosterone driven, including in elephants (Pushpakumara *et al.* 2018). GnRH vaccination 1-2 months prior to the predicted musth period has been shown to shorten the musth period or result in a complete cessation for that year. However, not all bulls respond to vaccination with a reduction in musth symptoms even when testosterone is reduced. It is also important to note that long-term treatment with GnRH vaccines may result in permanent immune-castration and sub- or infertility.

Conclusion

Balancing human and animal safety, and animal welfare needs is undeniably one of the greatest challenges facing handlers of elephant bulls in musth. More creative thinking is needed to explore more humane and enriching management practices. Use of long chaining in the forest with access to food and water, or a secure paddock with enrichment (e.g. pool, mud, dust, scratching post) and shelter should replace traditional methods involving short chains and hobbles (e.g. Santiapillai *et al.* 2011). Positive training methods should be part of this daily management, beginning when bulls are young. Integrating

bulls into herds with females and calves is important for meeting social needs, because like females, bull elephants also are highly social. It is important to extend protocols to involve a lifelong commitment to use of proper training, management and care techniques for all bulls, not just when they are in musth. Members of the AsESG are willing to provide recommendations and assist facilities to improve conditions for bull elephants.

Citation

The full document can be found on the website of the Asian Elephant Specialist Group at <<https://www.asesg.org/resources.php>>.

Brown JL, Corea R, Dangolla A, Easwaran EK, Mikota S, Oo ZM, Sarma K & Thitaram C (2020) *Management and Care of Captive Asian Elephant Bulls in Musth*. IUCN SSC Asian Elephant Specialist Group.

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