

A record of thanatological type behaviour in spotted hyaenas, *Crocuta crocuta* (Erxleben, 1777)

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Abstract: We note thanatological behavioural displays by clan members of a deceased spotted hyaena, *Crocuta crocuta* (Erxleben, 1777) in a fenced reserve. A matriarch had a lethal altercation with lions, *Panthera leo* (Linnæus 1758), on 10.V.2022. The carcass was monitored with a camera trap that recorded videos until the carcass was completely decayed. Four instances of clan members were recorded observing and sniffing the genitalia of the deceased hyaena over a period of six days. Within one month, the clan killed the deceased's cubs and moved their den location. We recommend further research be conducted into thanatological behaviours of spotted hyaenas as these behaviours could affect ethical considerations of management practices.

Key words: Social complexity; death; holistic management.

Short Communication

Thanatological behaviour is an animal's response to or behaviours pertaining to death. Thanatology has been recorded in primates, corvids, cetaceans, elephants, and more recently, carnivores (Gonçalves and Biro 2018; Yosef et al. 2021). The recognition of death in conspecifics could provide insights into the extent of sociality of the species and guide conservation approaches. Primates have complex social structures and strong bonds within groups, with thanatology having been described in multiple primate species (Gonçalves and Carvalho 2019; Carter et al. 2020). Both African and Asian elephants (*Loxodonta africana* (Blumenbach, 1797), *Elephas maximus* (Linnæus, 1758)) have been recorded revisiting sites of deceased individuals, displaying behaviours such as sniffing and nudging a carcass (Goldenberg and Wittemyer 2020). Thanatology in felid carnivores has only been described on one occasion in leopards (*Panthera pardus fusca* (Linnæus, 1758)) (Yosef et al. 2021) and on one occasion in striped hyaenas, *Hyaena hyaena* (Matius, 1882) (Shteckler and Yosef 2023).

Spotted hyaenas (*Crocuta crocuta* (Erxleben, 1777)) live in socially complex societies and have cognitive abilities ranking amongst those of primates (Holekamp et al. 2007).

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Therefore, it would be conceivable for spotted hyaenas to display thanatological behaviours similar to those species that have aligned social systems. Spotted hyaena greeting ceremonies consist of sniffing of genitalia and facial displays such as grimacing, these interactions are important in identifying social rank, sex, and reproductive state (Smith et al. 2011).

Madikwe Game Reserve (Madikwe hereafter), South Africa, is a fenced 650 km² reserve with an estimated population size of 82 spotted hyaenas which form five distinct clans (Honiball 2021). Although Madikwe is a fenced protected area, there has been no interference in the spotted hyaena population for over a decade through offtake or introductions. Therefore, we consider the spotted hyaena population in Madikwe to exist in a natural social state. Interactions between lions, *Panthera leo* (Linnæus, 1758), and spotted hyaenas are not infrequent although rarely lethal in Madikwe. On 10.V.2022 the matriarch of the “Tlou Clan” had a lethal interaction with two male lions. The altercation occurred 2.58 kilometres from the communal den. After the female spotted hyaena was confirmed deceased, we placed a black flash Cuddeback camera trap (Non-Typical Inc.; Green Bay, Wisconsin, USA) to monitor possible scavenger activity around the carcass. The camera was set to take 30-second videos when triggered by motion or a change in heat. The camera was placed from 13.V.2022, and removed on 26.V.2022. A total of 68 videos were recorded, mostly comprised of black-backed jackal (*Canis mesomelis* (Schreber, 1775)) consuming maggots on and around the carcass. The carcass was frequently assessed in person to record any signs of consumption from mammalian or avian scavengers.

The carcass decomposed completely by 26.V.2022 (16 days) entirely from maggots and carrion beetles. No consumption by mammalian or avian scavengers of the carcass was observed until only bones remained; thereafter a brown hyaena (*Parahyaena brunnea* (Thunburg, 1820)) carried the bones away. Brown hyaenas visited the site daily where they sniffed the site and consumed maggots. Brown hyaena site sniffing appeared more random than targeted to certain areas and aligned with typical scavenging behaviours. No species other than spotted hyaena sniffed the genital area of the deceased spotted hyaena.

Spotted hyaenas from the deceased’s clan visited the carcass on four separate occasions over the first six days of decomposition. During these times, videos recorded individuals sniffing the deceased’s genitalia and then moving on (Honiball and Venter 2022). The uploaded video shows a clan member approaching the site and sniffing bushes around the carcass (Honiball and Venter 2022). The individual then pushes past the bushes to sniff the deceased’s genitalia. The carcass is located offset to the right in the video, with the rear end positioned toward the camera trap (Figure 1).

In greeting ceremonies, and to reinforce social bonds, spotted hyaenas have been observed sniffing conspecifics’ genitalia (East et al. 1993). Further, anal secretions (pastings) also hold information on individual rank, sex, reproductive state, and identification (Burgener et al. 2009). Therefore, we suggest that the same genitalia sniffing behaviour displayed by the conspecifics to the deceased was likely to reaffirm the identity of the deceased individual. After the carcass was in the advanced stages of decomposition, the clan no longer visited the site. We suggest this may be because the carcass was no longer recognisable by scent to the conspecific’s clan. The focal clan of this observation was extensively monitored, and all members of the clan were known at the time of the observation. Three weeks after the incident, the clan killed the deceased’s two young cubs (one-month-old) by biting the cubs on the neck and breaking their spines, post-mortems were conducted to confirm this. Thereafter, the clan moved den sites to a new area, 5.79 km away.

Spotted hyaenas function in a fission-fusion society, therefore, it is not uncommon for individuals to come and go from the communal den for varying periods of time (Strauss et al. 2021). However, the removal of the deceased's offspring by the clan would indicate that the clan was not fearful of the repercussions of removing a high-ranking female's offspring (which too would have ranked higher than all remaining members present).

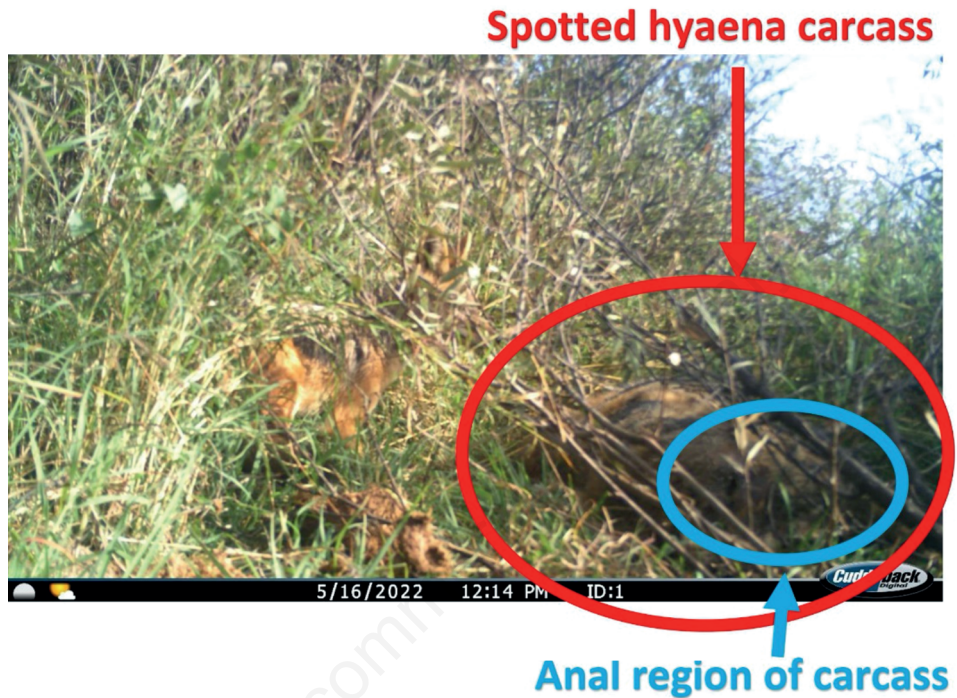


Figure 1. Two sample images from videos recorded at a spotted hyaena carcass in Madikwe Game Reserve, South Africa. The top image shows the location of the carcass behind bushes, specifying the location of the anal region. The bottom image is a sample showing a clan member sniffing the anal region of the carcass, where the head of the clan member can be seen between its two front legs.

Brown et al. (2021) show through long-term data that although infanticide is the leading cause of death in juveniles, infanticide of juveniles after the death of their mother is rare. Infanticide of juveniles after the removal of the mother was only recorded on one occasion throughout the history of their studies (Brown et al. 2021).

Typically, in thanatological behaviour there is a maternal link, most commonly with the death of offspring occurring (Appelby et al. 2013; Yosef et al. 2021; Pokharel et al. 2022). Reports detail mothers transporting their deceased young until eventually moving on without the corpse (Appelby et al. 2013; Yosef et al. 2021; Pokharel et al. 2022). A case of a leopard and another of a dingo, *Canis dingo* (Meyer, 1793) mother both exhibit nudging and transport of their deceased young (Yosef et al. 2021; Appelby et al. 2013). Behavioural observations typically occur where offspring are deceased with only a few cases noting the death of a dominant individual such as in Douglas-Hamilton et al. (2006) where a matriarchal African elephant was found deceased. Much like elephants, who only nudge and sniff the deceased individual, the spotted hyaena in our observation did not attempt to move the deceased matriarchal hyaena. Only one other case of thanatology has been reported in Hyaenidae, where Shteckler and Yosef (2023) monitored a striped hyaena repeatedly visiting a deceased assumed offspring. The observations of the first striped hyaena were similar to our spotted hyaena observations, where individuals frequently visited the deceased and sniffed the remains but did not feed on the deceased individual.

Records of thanatological behaviour in wildlife are increasing with different behaviours being observed (Shteckler and Yosef 2023). Some behaviours are extensive and taxing on the remaining individuals such as transporting the deceased, while other behaviours are more subtle such as reaffirming the identity of passed individuals. However, all behaviours are in species which either have strong social group bonds or strong maternal bonds, emphasising the complexity of social behaviour in wildlife. The societal effect of removing individuals from socially complex systems should thus be considered. Particularly in fenced protected areas whereby the management of species is largely controlled by human intervention, in the form of off-take or translocation. We recommend that due to the observed disruption of clan dynamics caused by the removal of a matriarchal female, social rank should guide off-take decisions. We recommend that low-ranking individuals be targeted for removal if needed, to mimic the natural dispersal behaviour of spotted hyaenas, to not disrupt clan dynamics and to not create potentially high levels of stress within clans.

Authors' contributions

TH conceptualized the study, collected and analysed the data and wrote the article, with support from JV. All the authors have read and approved the final version of the manuscript and agreed to be held accountable for all aspects of the work.

Conflict of interest

The authors declare no potential conflict of interest.

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Availability of data and materials

Data can be accessed via Honiball and Venter (2022).

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