Received: 21 October 2019 | Revised: 28 December 2019 | Accepted: 19 January 2020

DOI: 10.1111/aje.12723

African Journal of Ecology WILEY

NOTE AND RECORD

First confirmed record of infanticide for wild brown hyaena

Sarah Edwards | Jenny Noack | Louis Heyns | Diethardt Rodenwoldt

The AfriCat Foundation, Otjiwarongo, Namibia

Correspondence: Sarah Edwards, The AfriCat Foundation, PO Box 1889, Otjiwarongo, Namibia.
Email: sarah@africat.org

Funding information
Namibian Wildlife Conservation Trust; Ernest Kleinwort Charitable Trust; Varta Consumer Batteries Namibia; Okonjima Lodges CC

1 | INTRODUCTION

Infanticide, the killing of conspecific young, has been recorded for a wide variety of species including 91 mammalian species and is predicted to be particularly common in carnivores due to their carnivorous nature and the fact that most bear altricial young (Packer & Pusey, 1984). Infanticide has been recorded for large carnivore species including lion *Panthera leo* (Schaller, 1972), spotted hyaena *Crocuta Crocuta* (White, 2005) and leopard *Panthera pardus* (Ilany, 1990). Whilst the reasons for infanticide are still widely disputed, adaptive selection is the mostly commonly accepted interpretation, with four main hypotheses offered: (a) Predation hypothesis: infanticide is a simple mechanism to acquire food resources (Hrdy, 1979). (b) Resource competition hypothesis: the perpetrator and/or its offspring are left with increased access to resources such as food or space (Hrdy, 1979). (c) Adoption avoidance hypothesis: females commit infanticide to avoid adopting and providing paternal care to unrelated offspring (Hrdy, 1979). (d) Sexual selection hypothesis: males kill offspring to destroy another male's offspring and increase their own chances of mating (Hrdy, 1979). To date, infanticide has not been recorded for brown hyaena *Parahyaena brunnea*.

Brown hyaena are highly social, forming clans consisting of related females and their offspring and natal and non-natal males. In addition to clan living individuals, approximately 8% of the population consists of nomadic individuals, described as those moving through several clan territories, and having no lasting relationships with conspecifics (Mills, 1990). The communal den is the focal point of brown hyaena society, and cubs of three months and upwards are raised at such sites with all clan members bringing food and helping to raise cubs. Females give birth at natal dens largely isolated from other clan members. Clan females are known to nurse each other's cubs, although they show a clear preference for their own (Mills, 1990). Infanticide has been previously recorded in captive brown hyaena populations (Brandl, Capova, & Kucera, 2001; Eaton, 1981). Here, we describe the first record of infanticide in wild brown hyaena and briefly discuss potential reasons for this.

2 | METHODS

The natal den of an uncollared female brown hyaena with two cubs estimated to be 10 weeks of age (Figure 1) was opportunistically found on 4 October 2019 at Okonjima Nature Reserve (ONR). ONR is a privately owned, 200 km^2 nature reserve located approximately 50 km south of Otjiwarongo, north-central Namibia. The reserve is fully enclosed with a game-proof electric fence, with the spatial data of GPS-collared brown hyaenas (n = 11) showing they not to cross the fence. The ONR brown hyaena population density is estimated at 24.01 brown hyaena/100 km^2, the highest recorded density throughout its distribution, which is attributed to the enclosed nature of the reserve, inflated herbivore abundance and high leopard density offering additional scavenging opportunities via kleptoparasitism (Edwards, Noack, Heyns, & Rodenwoldt, 2019).

The natal den was monitored using a Hikvision (Bramley, Johannesburg, South Africa) DS-20D2043GO-1 4-megapixel, infrared, fixed bullet network camera from 09:43 4 October 2019, linked via a radio connection to a central communication tower. The camera was set at a height of approximately 1.20 m in an effort to try and stop hyaenas from chewing it and focused between two den burrows at a distance of approximately 8 m, and set to record video when movement was detected. Video files were stored on a password-protected Hikvision 32 channel server network video recorder.

FIGURE 1 Mother brown hyaena and two cubs at the natal den on Okonjima Nature Reserve

3 | RESULTS AND DISCUSSION

The infanticide occurred on the 7 October 2019 at 17:48 by what was identified as a female brown hyaena. Sex was determined by the lack of testes recorded when the tail was lifted, although this could not be confirmed. The identity of the individual could not be ascertained. The events of the infanticide are detailed in Table 1 and shown in Videos S1 and S2. After the infanticide, the second cub was not seen again, and an inspection of the burrow showed no sign of it. The mother visited the den for a further six days (Table 1), after which warthog *Phacochoerus africanus* started using the burrows. Other than the mother and the unidentified animal, a collared male from a neighbouring clan was seen sniffing at the burrow entrances on 4 October for 4 min before leaving.

To the best of our knowledge, this is the first confirmed record of infanticide for wild brown hyaena. Several potential reasons for the infanticide may be considered; however, we postulate that the main driver for the infanticide stems from the high population density and enclosed nature of the study site. The predation hypothesis might provide a plausible explanation; the perpetrator may have opportunistically killed the cubs for food. It is presumed the perpetrator took the dead cub away to consume; however, this cannot be confirmed. The resource competition hypothesis might also provide an explanation: the individual may have killed the cubs in order to secure resources as food or, if the individual was a female, the den site for

TABLE 1 Observation from the recordings at the brown hyaena natal den on the day of the infanticide and following days, until the mother stopped visiting the den

Date	Time	Observation
7th October	17:09	Mother arrives at den and puts head down the burrow to call cubs, at which both come out. Mother starts suckling both cubs
7th October	17:20	Mother leaves den
7th October	17:31	Both cubs enter the burrow
7th October	17:48	Unknown brown hyaena appears, stalks towards the burrow and makes a quick dash into the burrow. Due to the lack of movement whilst the individual is in the burrow, the recording stops. Video S1
7th October	17:49	The recording starts again when the unknown brown hyaena brings one cub out of the burrow, bites the neck/head area and carries it away. Video S2
7th October	18:18	Mother arrives at the den, sniffing and digging at the burrow the cubs were in
7th October	18:28	Mother arrives at the den, sniffing at the burrow entrance
8th October	03:08, 03:32, 17:46	Mother visits the den three times, each time sniffing at the burrow entrance
9th October	06:01, 07:20	Mother visits the den twice and spends two hours resting at the burrow entrance (07:20)
10th October	01:58, 2:44, 06:45, 19:10	Mother visits the den four times, and on two visits (01:58 & 02:44), she is carrying two (different) unidentified food items, which she carries away with her
11th October	00:09, 00:33, 05:24, 06:22	Mother visits the den four times, and on two visits (00:0 & 00:33), she is carrying two (different) unidentified food items, which she carries away with her
12th October	17:24	Mother visits the den, sniffing at the burrow entrances
13th October	1:52	Mother visits the den, sniffing at the burrow entrances

her own current or future offspring. It is predicted the resource competition theory will be more common in times of low resource abundance or high population density (Hrdy, 1979), and the latter is met on ONR. Stress has been previously been identified as a potential contributor to the occurrence of infanticide in captive brown hyaenas (Brandl et al., 2001), and the high-density population on ONR may also contribute to a stressful environment for brown hyaenas which may in turn lead to unusual behaviours such as infanticide.

Brown hyaenas nurse other clan members' young, with females within a clan usually being related (Mills, 1990). However, pressure on breeding individuals due to the high population density may have prompted the presumed female to kill the cubs as a mechanism for preventing these cubs from nursing from her when brought to the communal den. White (2005) recorded only females committing infanticide in spotted hyaenas, with full sisters of the mothers killing cubs shortly after they were brought to the communal den. Although brown hyaena cubs are likely related to females within the clan, Hausfater and Hrdy (1984) postulate that close kin may represent one's closest competitors and the elimination of a future competitor may be more genetically advantageous than altruistic behaviour. Being able to identify the individual and its relation to the mother, that is belonging to the same clan or not, would have given a greater insight into the event. Monitoring of brown hyaena natal and communal dens, in combination with genetic studies, is encouraged to record more incidences of infanticide for the species.

ACKNOWLEDGEMENTS

We thank Jacques Junius for his technical support and the Namibian Wildlife Conservation Trust, the Ernest Kleinwort Charitable Trust, Varta Consumer Batteries Namibia and Okonjima Lodges CC for their financial support. Thanks to Kambaka Markus for finding and reporting the natal den. The study was conducted under the National Commission on Research, Science and Technology permit RCIV00032017.

CONFLICTS OF INTEREST

The co-authors report no conflicts of interest.

DATA AVAILABILITY STATEMENT

All data for this short note have been submitted as Supporting Information in the form of two video files.

ORCID

Sarah Edwards https://orcid.org/0000-0002-2445-6446

REFERENCES

Brandl, P., Capova, B., & Kucera, J. (2001). Brown hyenas (*Parahyaena brunnea*) in Prague Zoo – A short recapitulation on occasion of 33 years of breeding. *Gazella*, *33*, 33–41.

Eaton, R. L. (1981). The ethology, propagation and husbandry of the brown hyena (*Hyaena brunnea*). *Zoologischer Garten*, *51*, 123–149.

Edwards, S., Noack, J., Heyns, L., & Rodenwoldt, D. (2019). Evidence of a high-density brown hyena population within an enclosed reserve: The role of fenced systems in conservation. *Mammal Research*, *64*, 519–527. https://doi.org/10.1007/s13364-019-00432-7

Hausfater, G., & Hrdy, S. B. (1984). *Infanticide: Comparative and evolutionary perspectives*. New York, NY: Aldine Publishing Co.

Hrdy, S. B. (1979). Infanticide among animals: A review, classification, and examination of the implications for the reproductive strategies of females. *Ethology and Sociobiology*, *1*, 13–40. https://doi.org/10.1016/0162-3095(79)90004-9

Ilany, G. (1990). The spotted ambassadors of a vanishing world. *Israel Al*, *31*, 16–24.

Mills, M. G. L. (1990). *Kalahari hyaenas: The comparative behavioural ecology of two species*. London, UK: Allen and Unwin.

Packer, C., & Pusey, A. E. (1984). Infanticide in carnivores. In G. Hausfater, & S. B. Hrdy (Eds.), *Infanticide: Comparative and evolutionary perspectives* (pp. 31–42). New York, NY: Aldine Publishing Co.

Schaller, G. B. (1972). *The Serengeti lion: A study of predator-prey relations*. Chicago, IL: University of Chicago Press.

White, P. A. (2005). Maternal rank is not correlated with cub survival in the spotted hyena, *Crocuta crocuta*. *Behavioral Ecology*, *16*, 606–613. https://doi.org/10.1093beheco/ari033

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

How to cite this article: Edwards S, Noack J, Heyns L, Rodenwoldt D. First confirmed record of infanticide for wild brown hyaena. *Afr J Ecol*. 2020;00:1–3. https://doi.org/10.1111/aje.12723