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Cover: Common Keeled Skink *Eutropis carinata* in oil pastels, colour pencils, & micron pen adapted from photograph by H. Byju © Pooja Ramdas Patil.

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ARTICLE

Unearthing calf burials among Asian Elephants *Elephas maximus* Linnaeus, 1758 (Mammalia: Proboscidea: Elephantidae) in northern Bengal, India

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Abstract: Rampant environmental changes and forest destruction push elephants, both Asian and African, to explore human spaces to fulfil their dietary and ecological requirements and, consequently in shared spaces many 'novel' elephant behaviors come into the limelight. Elephant calf burial is reported in African literature but remains absent from the Asian context. We report calf burials by Asian Elephants in the eastern Himalayan floodplains of the northern Bengal landscape. The study area consists of fragmented forests, tea estates, agricultural lands, and military establishments. Tea estates form the majority of elephant corridors, and we explain the burial strategy of elephants in the irrigation drains of tea estates. We present five case reports of calf burials by elephants. We aimed to understand the perimortem strategy and postmortem behavior of the Asian Elephants. The major findings reflect that the carcasses were carried by trunks and legs for a distance before being buried in a 'legs-upright-position'. We further investigated the underlying reason for calf deaths through postmortem examinations. Direct human intervention was not recorded in any of the five deaths. Through opportunistic observation, digital photography, fieldnotes, and postmortem examination reports, we suggest that the carcasses were buried in an abnormal recumbent style irrespective of the reason for the calf's death. Through long-term observation, we further report that the elephants in this region clearly avoid the paths where carcasses were buried. We discuss and connect the literature of two distinct elephant species and also compare thanatological studies of other sentient nonhuman species.

Keywords: Animal behavior, eastern Himalaya, northeastern India, sentient nonhuman species, tea estates, thanatology.

सार: बड़े पैमाने पर पर्यावरणीय परिवर्तन और वन विनाश दोनों एशियाई और अफ्रीकी हाथियों को मानव स्थानों पर आने के लिए मजबूर करते हैं। उनकी आहार संबंधी और पारिस्थितिक आवश्यकताओं को पूरा करने के लिए और, परिणामस्वरूप साझा स्थानों में हाथियों के कई अनोखे व्यवहार सामने आते हैं। अफ्रीकी साहित्य में हाथी के मृत बच्चों को दफ़नाने की बात बताई गई है लेकिन एशियाई संदर्भ में यह अनुपस्थित है। हम उत्तरी बंगाल परिदृश्य के पूर्वी हिमालयी मैदानों में हाथी द्वारा मृत बच्चों को दफ़नाने की रिपोर्ट प्रस्तुत करते हैं। अध्ययन क्षेत्र में खंडित वन, चाय बागान, कृषि भूमि और सैन्य प्रतिष्ठान शामिल हैं। चाय बागानों में अधिकांश हाथी गलियारे हैं, और हम चाय बागानों के सिंचाई नालों में हाथियों की रणनीति अथवा उनके मृत बच्चों को दफनाने की व्याख्या करते हैं। हम हाथियों द्वारा मृत बच्चों को दफनाने के पांच मामले प्रस्तुत करते हैं। हमारा लक्ष्य था की एशियाई हाथियों की पेरिमॉर्टम रणनीति और पोस्टमॉर्टम व्यवहार को समझें। प्रमुख निष्कर्ष दर्शाते हैं कि शव 'पैर-उप्पारी-स्थिति' में दफनाने से पहले कुछ दूरी तक सूंड और पैरों द्वारा ले जाया गया। हमने अंतर्निहित और पोस्टमॉर्टम जांच के माध्यम से हाथी के मृत बच्चों की मौत का कारण बताया गया। पाँचों मौतों में से किसी में भी प्रत्यक्ष मानवीय हस्तक्षेप दर्ज नहीं किया गया। विभिन्न माध्यम जैसे की - अवसरवादी अवलोकन, डिजिटल फोटोग्राफी, फील्डनोट्स और पोस्टमॉर्टम परीक्षा रिपोर्ट से हम सुझाव देते हैं कि हाथी के बच्चों की मृत्यु का कारण चाहे जो भी हो, उसे असामान्य लेटी हुई शैली में ही दफनाया गया। दीर्घकालिक अवलोकन के माध्यम से, हम आगे की रिपोर्ट देते हैं। इस क्षेत्र में हाथी स्पष्ट रूप से उन रास्तों से बचते हैं जहां शवों को दफनाया गया था। हमने दो हाथी की प्रजातियों के साहित्य को जोरते हुए चर्चा करी और अन्य संवेदनशील गैर-मानवीय प्रजातियों के थानाटोलॉजिकल अध्ययनों की तुलना भी करी।

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INTRODUCTION

Human-induced rapid environmental change often alters non-human species' reproductive, nutritional, and physiological behavior (Chartier et al. 2011; Sih et al. 2011). Both Asian Elephants *Elephas maximus* and African Elephants *Loxodonta africana* face land-use challenges more than other species due to their substantial dietary requirements and extensive home ranges (Young et al. 2007; Kshettry et al. 2020; Roy et al. 2022). Known for their strategic planning and cooperation, these social animals also become victims of environmental modifications, and the resultant low fertility and high calf mortality rates emerge as noted unforeseen consequences (Mar et al. 2012). Realizing the slow reproductive rate in elephants, calf deaths directly influence their population dynamics. While these sentient megaherbivores constantly adapt to land-use and environmental changes to increase survival rates, they demonstrate various novel behaviors. Many such behaviors pertaining to offspring affection comes to the limelight when they frequently use the human domain. One such behavior is how they bid farewell to their deceased calves and the behavior of the herd thereafter.

The manner in which nonhumans address the dying and the dead reflects their cognition and emotional side (Hawley et al. 2018; Watson & Matsuzawa 2018; Carter et al. 2020; Fernández-fueyo et al. 2021). Animal behavior and thanatology, therefore, remain a central part of understanding the overall fitness of nonhuman species in a changing landscape (Gil et al. 2020). Most animal species, unlike humans, pay less interest to their dead conspecifics. Different species' 'weak' cognitive abilities and disease avoidance theories support this 'leaving alone' behavior (Goldenberg & Wittemyer 2019). However, cetaceans, primates, and elephants show contrasting examples of strong behavioral reactions to their deceased young ones. While such caring behavior between the mother and the offspring among different mammal species is observed (Bercovitch 2020), notably, the entire herd project affectionate behavior among elephants (McComb et al. 2006). With up to 22 months of gestation, these K-strategist species invest much emotional energy in their young ones, even after their demise.

For instance, a behavior where the elephant carcass parts were carried across a distance, covering the carcass with vegetation ("weak" burial), or observing the carcass over several hours has been covered in various scholarships concerning the African Elephants (Douglas-Hamilton & Douglas-Hamilton 1975; Goldenberg & Wittemyer 2019). Apart from elephants, burial behavior has also been observed in the termite species *Reticulitermes fukienensis* (Fernández-fueyo et al. 2021), but in no other large mammals. Calf burials by elephants are among the less-studied topics of thanatology, especially in Asia (Sharma et al. 2019), even though this practice is known to the conservation community. Elephants show a variety of behavior ranging from investigative, stationary, self-directed, social, and mourning behavior around their dead conspecifics (Hawley et al. 2018; Goldenberg & Wittemyer 2019; Watts 2019; Stephan et al. 2020).

Even though such sensory behaviors have been vastly studied, most of these research articles fail to report the exact cause of calf deaths and weakly contribute to animal thanatology. The cause of death remains a salient mediator to individual responsivity (Bercovitch 2020). We deem it urgent as the herd's behavior (especially the mother) may vary in deaths due to natural illness and accidents (injury and wounding). Calves up to five years of age experience mortality risks due to various factors such as maternal age, sex of the calf, inter-birth intervals, and whether firstborn or later-born (Mar et al. 2012; Rutherford & Murray 2020). Controlled studies have reported 43.3% of deaths due to accidents among young calves (Mar et al. 2012); therefore, the resultant behavior remains critical and dependent on the cause of death.

From an evolutionary biology standpoint, natural illness and the consequent death ultimately increase the fitness of the surviving population (Fernández-fueyo et al. 2021). Thus, an incident of calf death is expected to not to escalate the conflict against humans. However, in case of accidental deaths (attributed to humans), revenge behavior has been observed across many species such as elephants (Chalcraft 2015), primates (Watts 2019), and more recently among Orcas *Orcinus orca*. Retaliation and revenge by elephants escalate the human-elephant negative interactions (HENI) and pose a severe challenge to wildlife managers and anthropologists. However, various socio-ecological and political factors still determine the magnitude of HENI, but such factors are beyond the scope of this study. This study rather contributes to the ecological behavior of elephants, both peri and postmortem, while investigating death causes through postmortem reports of carcasses and attempting to bridge the two different elephant species and draw commonalities and contrasts between the two as far as thanatology is concerned.

While elephants occupy only 5% of their historic

home range globally, India hosts more than 60% of the global Asian Elephant population despite being one of the most populated countries in the world (Leimgruber et al. 2003; Sukumar 2006). As much as 78% of their current habitat lies outside protected areas (PAs) in heterogenous landscapes (Naha et al. 2020). With an ever-increasing human population alongside livestock and agricultural land on the one hand, and conservation efforts to increase the large mammal population on the other hand, the human-nonhuman overlap increases (Sukumar 1989; Goswami et al. 2015). The Asian Elephant is listed as 'Endangered' on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species and is regarded as a sentient being for its intelligence. Many novel behaviors come to the limelight when elephants use non-forested areas more frequently. The study's novelty lies in the unique style of burial of elephant calves inside tea estates (TEs) of northern Bengal.

Along with a green cover and comparatively undisturbed passage for the pachyderms, the TEs also provide ample stretch of irrigation drains which the elephants have learnt to use differently. The irrigation drains move out excess water during the monsoon season to protect the tea bushes. However, elephants reportedly use these depressions to bury their deceased offspring. This study also presents the first photographic report of dead calf burial by elephants in the TEs.

We aimed to (1) study the cause of death of the elephant calves, (2) understand the rationale behind the unique carcass burial strategy, and (3) observe the postmortem behavior among elephants near the burial sites. We report the underlying reasons, from postmortem examination reports for the calf deaths, as well as anecdotal evidence of herd members during peri and postmortem phases. This study contributes to the existing literature on elephant behavior and thanatology through a combination of observation, analysis, and interpretation methods.

MATERIALS AND METHODS

Study area

The northern Bengal landscape is comprised of fragmented forests, tea estates, network of rivers flowing, agricultural fields, and military establishments intersected by railways and highways (Figure 1). While there has been a constant decrease in the wildlife habitat over the last few decades, the four districts of northern Bengal—Darjeeling, Kalimpong, Jalpaiguri, and Alipurduar—together host >500 elephants (MoEF & CC 2017). The land-use and landcover analysis highlights a 44% percent increase in human settlements and a seven percent decrease in the sand bed area in the last decade (Naha et al. 2019). Parallelly, Roy & Sukumar (2015) identified 59 elephant corridors, while 80% of these corridors experience a high degree of encroachment. With shrinking ecological corridors but considering peoples' tolerance (Roy et al. 2022), the elephant population increases and is 'pushed' through TEs, cited as 'natural corridors' in modern human-elephant 'conflict' literature. Exponential increase from 10,000 acres in 1866 to 50,000 acres in 1905, the tea industry has emerged as a static livelihood option to many and welcomed many migrants (Xaxa 2001). The number has grown further over the next century and currently covers approximately 1,350 km^2 of land (Kshettry et al. 2020).

Data collection

We triangulated the findings through opportunistic observation, digital photography and fieldnotes, and postmortem examination reports. These are explained below:

Opportunistic observation: The jurisdiction of wildlife divisions in northern Bengal spreads across forest villages, revenue lands, TEs, and any other area where wildlife is present. The five discussed case reports originated through opportunistic observation. This method corresponds to spontaneous observation and recording of the behavior of any natural event by the researcher or any concerned individual (Altmann 1974; Carter et al. 2020; Pokharel & Sharma 2022). The researcher then captures the event through photography, field notes, videography, or audio recording, followed by long-term observation.

Digital photography and fieldnotes: The researchers took photographs of these burial incidents, forest department officials and the tea garden management, which were later analyzed (de Silva et al. 2017; Goldenberg & Wittemyer 2019; Carter et al. 2020). The researchers and tea garden management collected evidence of elephant visitation around the burial site. All the burial sites were far from human settlements, and identifying the particular elephant herd at night was challenging for the locals. However, the researchers and tea garden management regularly monitored the specific pathways while preparing field notes to look for indirect evidence such as dung boli and footsteps.

Postmortem examination reports: Four veterinary officers conducted the postmortem report in the presence of the forest officers of respective wildlife

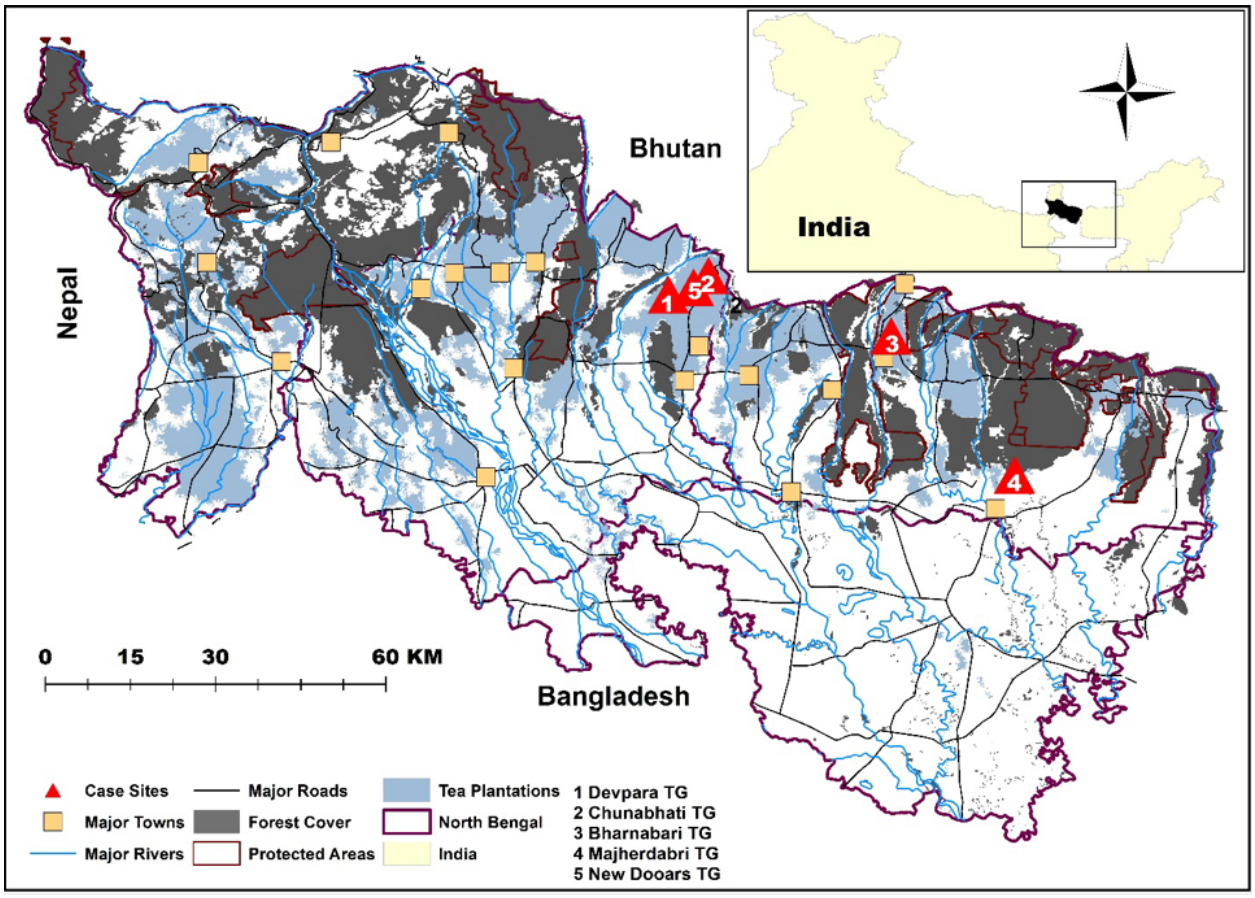

Figure 1. Map of study area showing all case sites along with major land-use types.

divisions. The postmortem report of the deceased calves reveals the reason for deaths, underlying illness, health conditions, and various parameters (see Table 1). While other research articles suspect the cause of calves' death through indirect evidence (Goldenberg & Wittemyer 2019; Sharma et al. 2019), this study gives detailed proof of the cause of death. Also, the postmortem examination report reflects the estimated time of death of the calf and deduces the 'in-transit' time and the time under the ground.

RESULTS

We report five calf burial cases in different TEs in the study area (Figure 1). We present the findings in two sections, (1) internal examination through postmortem examination report and (2) external examination and field anecdotes.

Internal examination through postmortem report (see Table 1).

External examination and field anecdotes

The most surprising finding of this study is the positioning of elephant carcasses during burial. In all five cases, the legs were upright, and the head, trunk, and dorsal parts were fully buried. Due to the limited depth of the irrigation drains in TEs, the legs of the dead calves were visible above ground level (Image 1–5). We observed footsteps of herd members on both sides of the trench and over the soil covering the body, indicating a combined effort in burying the carcasses. While burying the carcass, the elephant herd vocalized for 30–40 min, as the TE night security guards reported. All the cases had minute contextual differences and are mentioned below as five different case reports:

Case 1 belongs to Devpara TE, which falls in the jurisdiction of the Gorumara Wildlife Division. The burial site's location (26.829477° N, 89.009466° E) was 350 m away from the nearest human settlement and approximately 4 km from the nearest reserve forest. It rained the night of burial, making it easier for the herd (N = 20) to bury the carcass. Loud vocalization from the herd was observed distantly. Large petechial hemorrhagic

Table 1. Details of postmortem reports of the five deceased elephant calves.

	Case 1	Case 2	Case 3	Case 4	Case 5
Forest division	Gorumara Wildlife Division	Gorumara Wildlife Division	Buxa Tiger Reserve (West)	Buxa Tiger Reserve (West)	Gorumara Wildlife Division
Date of death	12.ix.2022	17.xi.2022	19.viii.2022	27.x.2022	25.x.2023
Time of death	0200 h	1400 h	0300 h	0600 h	2300 h
Location	Debpara tea garden	Chunabhati tea garden	Bharnabari tea garden	Majherdabri tea garden	New Dooars tea garden
Age of the calf	12 months	4–5 months	10 months	6–8 months	3–4 months
Weight	350 kg	200 kg	300 kg	250 kg	160 kg
Sex	Female	Female	Male	Male	Female
Trachea	NAD	Hemorrhagic froth present	Hemorrhagic froth present	Hemorrhagic froth present	Congested
Lungs	Congested and hemorrhagic	Congested and hemorrhagic	Congested and hemorrhagic	Congested and hemorrhagic	Highly congested
Heart	Epicardium—congested and hemorrhagic	Epicardium—congested and hemorrhagic	Epicardium— congested and hemorrhagic	Epicardium—congested and hemorrhagic	Epicardium—pin point hemorrhagic and congested
Diaphragm	NAD	Congested	NAD	Ruptured	Pale colored
Nutritional status	Poor	Poor	Poor to normal	Poor to normal	Poor to normal
Reason for death	Cardio-respiratory failure due to acute catarrhal enteritis	Multiple organ failure due to acute microbial infection	Cardio-respiratory failure	Respiratory failure	Septicemia resulting from acute microbial infection along with hernia and severe gastroenteritis
Body carcass	Intact	Intact	Intact	Intact	Intact
Entry/exit wounds	No	No	No	No	No

NAD—No abnormality detected.

lesions and contusions were found on the dorsal surface of the entire vertebral region (Supplementary Appendix 1). As per long-term observation, the frequency of the elephant movement was reduced by up to 70%. Elephants have started using parallel pathways, clearly avoiding the previous path where the carcass was buried. One of the parallel routes also witnessed a human death in quick succession after the calf burial. However, such human death incidents could have resulted from other socio-ecological and circumstantial factors. Fresh elephant dung boli of different sizes were also observed near the buried carcass. The locals worshipped the deceased calf before the forest department officials took it away.

Case 2 belongs to Chunabhati TE under the Binnaguri Wildlife Squad of the Gorumara Wildlife Division. The burial site (26.860416° N, 89.072500° E) was 150 m away from the nearest human settlement and 4.5 km from the nearest forest. Subcutaneous tissues were damaged, and wide hemorrhage were observed on the dorsal side of the body (Supplementary Appendix 2). It rained heavily on the night of the incident, and the soft soil layer facilitated an easier burial process. No vocalization was reported in this case. Elephant dung boli of various sizes present indirect evidence that the herd (N = 15) also consisted of adults, sub-adults, and young adults. Although it's challenging to identify the particular herd at night, the elephants clearly avoided the pathway of the buried carcass. Now, they take alternate routes to the nearby forest after night grazing.

Case 3 corresponds to Bharnabari TE under the jurisdiction of the Hamiltonganj range of the Buxa Tiger Reserve (Supplementary Appendix 3). This burial site (26.764752° N, 89.361850° E) was 300 m from the nearest human settlement. The tea garden management and the villagers observed the unusually prolonged vocalization of an elephant herd (N = 15–20) during their entire journey inside the TE. This vocalization involved both trumpets and roars. A fracture in the right hind limb was also observed. Long-term observation on this particular pathway reflected that the elephants scarcely used this pathway, and the frequency hasn't changed after the burial incident.

This TE was declared 'sick' in 2008 as the company was at a loss and could not fully support the welfare of the tea garden residents. Moreover, the TE was shut down between 2005–08 due to loss and management failure. These socio-economic and political reasons contribute to comparatively less human density in this

Image 1. A buried carcass corresponding to case 1 of Devpara tea estate. © West Bengal Forest Department.

Image 2. A buried carcass corresponding to case 2 of Chunabhati tea estate. © West Bengal Forest Department.

Image 3. A buried carcass corresponding to case 3 of Bharnabari tea estate. © West Bengal Forest Department.

Image 4. A buried carcass corresponding to case 4 of Majherdabri tea estate. © West Bengal Forest Department.

Image 5. A buried carcass corresponding to case 5 of New Dooars tea estate. © West Bengal Forest Department.

TE, thus, facilitating easier passage for the elephants. Footsteps of herd members were recorded around the burial site, and it seemed that the herd had attempted to bury the deceased to ground level.

Case 4 belongs to Majherdabri TE under the jurisdiction of the East Damanpur range of the Buxa Tiger Reserve (Supplementary Appendix 4). The burial site's location (26.544368° N, 89.557619° E) was around 500 m away from the nearest human settlement and close to the national highway. The 'partially buried' carcass was observed by the TE workers and followed by a postmortem examination by the Forest Department. As per the postmortem report, the calf died 60–72 h before the examination. We suggest that the elephant herd must have roamed for 40–45 h before finding an appropriate trench to bury the carcass; otherwise, the carcass would've been noticed by the TE labourers earlier.

Conversely, we also report a time lag between the time of death and burial and that the carcass was dragged to the appropriate point. This forest adjoining site allowed the elephants to access the trench and

return to the forest. As the carcass was detected after almost three days, the kidneys were partially putrefied. Moreover, there were bruises and contusions on the dorsal side of the carcass—more than that in the other reported cases. Thus, it indicates that the herd carried the carcass by the trunk or the legs for a longer time.

The soil eruptions over the body of the carcass represent that rigor mortis had passed, and the gaseous components blow out of the soil before the carcass was detected. This phenomenon refers to 'postmortem flatulence' or colloquially 'burial explosion'. Rigor mortis among elephants is usually after 12 hours and remains for the next 12 hours.

Case 5 belongs to New Dooars TE under the jurisdiction of Gorumara wildlife division (Supplementary Appendix 5). The burial site's location (26.8417^{0}N, 89.0488^{0}E) was 700 m away from the human settlement. Similar to other cases, the carcass was observed by TE workers and was taken for postmortem examination after 12 hours of death. Footsteps of herd members to bury and level the soil around the carcass was observed similar to other cases.

Similar to other cases, this case was also peculiar as the elephant herd abandoned this active migratory route after burying the deceased calf. They are reported to use different parallel paths after the incident.

Overall, we also observed contusions, mainly in the neck and dorsal parts along the vertebral column in all the cases. It was accompanied by hemorrhagic fluids in the trunks of most carcasses. Other observations reveal that the mucous membrane was pale and dry, and the tongue was soiled, congested, and inflamed in all cases. The average depth of the irrigation drains was found to be 0.65 m. No body part was missing. Field observation from south Bengal shows carrying behavior by the trunk and legs (Image 6).

Image 6. An elephant carcass being carried by a herd member. © West Bengal Forest Department.

DISCUSSION

Environmental changes and land-use patterns often bring novel behavior to the limelight. This study highlights one such behavior of carcass burial by Asian Elephants in the TEs of northern Bengal. We present confirmed anecdotes of carcass burials by elephants in the northern Bengal region. We reported five similar case reports to show the carcasses' strange 'legs-upright-position' and investigated the details of such behavior. Elephants are social animals, and their cooperative behavior has been widely published in scholarly articles. However, the 'calf burial' component of thanatology remains briefly studied for African Elephants and untouched for Asian Elephants. In this section, we compare our case reports with the existing literature on thanatology in two sub-sections, namely—1) perimortem and 2) postmortem behavior.

Perimortem behavior: Calf burial and other comparisons

In a first-ever recorded photographic and postmortem examination evidence of deceased calf burials by Asian Elephants, the study contributes to the existing 'faint' knowledge about calf burials by elephants globally. Through direct and indirect evidence, this study highlights elephants helping and compassionate behavior during the burial of the carcass. A few generalities have to be made about Asian Elephants' calf burial behavior arising from the five case reports presented above.

We state that Asian Elephants carry their deceased calves to isolated locations away from humans and carnivores while searching for irrigation drains and depressions to bury the carcass. Caring for and carrying the dead offspring has been reported in both altricial (mostly primates: Chimpanzees, baboons, and macaques) (Watts 2019; Carter et al. 2020) and precocial (elephants, giraffe, and peccaries, for instance) offspring (Watson & Matsuzawa 2018; Bercovitch 2020). There are unpublished reports from the West Bengal Forest Department of an elephant cow carrying the carcass for up to two days before leaving it in an isolated location in southern Bengal (Image 6). It's worth noting that only calves are carried, and the young adults/adults are not due to non-feasibility. In most cases, these sentient beings do not leave the carcass until putrefaction starts in the deceased calf or the carcass is taken over by the Forest Department officials. Such affinity towards their offspring is attributed to oxytocin and a prolonged gestation period (Bercovitch 2020). Such hormonal

response aligns with other studies on Chacma Baboons *Papio ursinus* (Carter et al. 2020), Olive Baboons *Papio anubis*, African Elephants, and Thornicroft's Giraffe *Girafa camelopardalis* (Bercovitch 2020). Published research articles on African Elephants have reported calf burials in rare cases (Douglas-Hamilton & Douglas-Hamilton 1975), but such literature remains absent from the Asian context (Sharma et al. 2019).

Our findings also suggest that the modified land-use types, such as TEs, offer connectivity and provide extended forest cover for elephant movement. There are no irrigation drains inside the PAs, and it's exceptionally challenging to locate burial activities/sites inside the closed canopy of the semi-evergreen and moist deciduous forests of northern Bengal—quite similar to why thanatological studies have briefly touched upon the less populated African Forest Elephants *Loxodonta africana cyclotis* (Hawley et al. 2018). Through extensive patrolling by the forest guards such deceased calves are often detached from the herd to ensure normal elephant migration and the subsequent crowd management which would have occurred on seeing such 'novel' behavior. With ample irrigation drains and no forest officials, the TEs, in these cases, emerge to be a perfect land-use type for burying the carcass. In addition to such burials by elephants, the TEs of northern Bengal also witness elephant births – thus, providing a common ground for life and death.

The most interesting finding of our study was the positioning of the carcasses in a 'legs-upright-position' in the limited space in the TEs. The locals and the conservation community often perceive these burials as 'accidental'. The 'strange' positioning of the carcass could be explained for better grip for the herd member(s) to hold and lay the calf in the trench. This strategic behavior also reflects the care and affection of the herd member(s) towards the deceased conspecific. This behavior suggests that in a situation of space crunch, the herd member(s) prioritize the head for the burial before the feet. Elephants are caring social animals, and based on external examination of the carcasses, we also suggest that the calves were placed delicately by gripping one or more legs by the herd member(s). However, we observed petechial hemorrhagic lesions and contusions on the dorsal side of the carcass in all the cases. The contusions in the dorsal part suggest that the carcasses were carried from a distance to locate and bury them at a preferred location (see Image 6).

This abnormal recumbency is due to a combination of three factors. First, preexisting 'tight' irrigation drains in TEs may lead to carcasses easily being buried. Second, elephants have become bolder and use human spaces to fulfil their behavioral and dietary needs. People's tolerance towards elephants in northern Bengal is higher than in other parts of West Bengal and other Indian states (Roy et al. 2022)—presenting a healthy coexistence scenario. Third, the absence of irrigation drains and the presence of more carnivores inside the forests projects a problematic situation for the elephants to choose. Historically elephants must have buried their deceased offspring inside forests subject to trench availability, and loose soil, among other environmental factors, but we also suggest that these megaherbivores adapt to the changing socio-ecological scenario and landscapes.

Such sentient behavior in a high human density region strengthens the morale of coexistence between humans and nonhumans. Thus, their conservation quotient increases through ethics, more than the elephants' ecological role, and boosts their socio-ecological rank in society. Such exalted status of elephants is further complemented through religious reverence among various communities worldwide, including India. Births and deaths are memorialized among the local communities and hold a special place in their rural culture, as was done in the case of Devpara TE. Cases 2, 3, and 4 didn't display any such homage due to the isolated location of the carcass and religious heterogeneity in the neighborhood.

Based on anecdotal evidence from TE managers and workers, the herd made loud vocalizations and left quickly—approximately 30–40 minutes. This behavior suggests that elephants distinguish human and nonhuman spaces and avoids dissension with humans.

Vocalization remains an expected behavior among Asian and African Elephants, which was limited to the burial phase. In these cases, loud trumpets may signify mourning and preparing for inter-specific aggression (Sharma et al. 2019). A second-hand account (formal interview with the forest range officer) showed a similar case inside Jaldapara National Park (an adjoining forest in the same landscape). The elephant herd stayed there for more than four hours near the burial site, most probably because it was undisturbed by humans. His other observation adds that the same herd visited the burial site multiple times to investigate various stages of decay. This observation aligns parallel to the behavior among African Elephants (Douglas-Hamilton & Bhalla 2006; Goldenberg & Wittemyer 2019).

Besides these behaviors, we also observed the efforts of various herd members through their footprints in levelling the soil above/around the carcass – supporting the social-bonds hypothesis. Moreover, from the size of

the footsteps and dung boli, we also infer that carcass burying was a combined effort from allomothers and herd members of different age groups. Such indirect signs have been recorded in India (Sharma et al. 2019) and Africa (Goldenberg & Wittemyer 2019), even though those observations were only limited to mourning and gathering. Also, the herds operated in small numbers, parallel to previous studies on Asian Elephants (Pokharel & Sharma 2022) but contrary to African Elephants (de Silva et al. 2017). Thus, due to the absence of a hierarchical structure among Asian Elephants, we report commensurate efforts in the burial of the deceased conspecifics by the surviving herd members, unlike African Elephants, where the nonhuman agency works in hierarchical order (Sharma et al. 2019).

Postmortem behavior

Following the wildlife protocol, the forest department removed the buried carcasses and kept the records for research and training. Thus, a further comparison concerning 'visiting the carcass' cannot be made between Asian and African Elephants. In natural settings, elephants have been reported to visit the burial site at various stages of decomposition both in Africa (Hawley et al. 2018; Goldenberg & Wittemyer 2019; Rutherford & Murray 2020) and Asia (Pokharel & Sharma 2022). This case study shows the opposite behavior altogether. In all the examples, the herd fled the site within 40 minutes of burial. A formal interview with the tea garden managers shows that the elephants now use a parallel pathway and completely avoid their previous 'active' route. This observation was complemented by indirect evidence of dung boli and footsteps that the elephant herds use the parallel pathways more often than before. This behavior comes up as a new contrasting behavior to the African species who spend a lot of time investigating and exploring the elephant remains (Douglas-Hamilton & Bhalla 2006). In conclusion, the burial location plays a central role in determining the postmortem behavior among elephants, whether inside or outside the PAs.

All observations were opportunistic and must not be generalized for the entire study area or other regions of similar biogeographic and environmental conditions. We report only the cases outside PAs and the behavior thereafter. The behavior of the elephant herd inside PAs could be similar to the African species, or not. In all cases, all elephant herds avoid burial sites and take parallel routes.

All of the deceased calves were not more than 12 months of age, and similar to studies on captive elephants, wild Asian Elephants also remain susceptible to death in early years (Mar et al. 2012). All the death cases happened due to prevailing illness or natural unfavorable circumstances, including death due to falling into the irrigation drains. We restrained from putting forward the exact reason that claimed the deaths of these calves. However, we claim that irrespective of the cause of death, the elephant herd attempts to bury the carcass in an abnormal recumbency position inside TEs. Even though the nutritional status of all the calf carcasses was poor and poor-to-normal, we also step back in categorizing the deaths into natural or accidental, except in case 2 and case 5, where the elephant calves died of multiple organ failure due to acute microbial infection. Cases 1, 3, and 4 suggest deaths due to cardio-respiratory failure, which could have arisen for numerous reasons, including falling into the trench, being trampled, or suffocating to death naturally. Thus, we refrain from stating that all the deaths happened outside TEs. At the same time, we also report that all the irrigation drains where the carcasses were buried were too shallow (0.60–0.70 m) and less probable for calves to slip into and die. We also eliminate any possibility of infanticide in any of the cases as reported in other cognitive species, such as Chacma Baboons (Carter et al. 2020) and Mountain Gorillas *Gorilla beringei beringei* (Watts 2019). This remains an open platform for future research among academics researching elephant behavior and thanatology. Subsequently, we repress from commenting on whether these death cases would trigger HEC.

Even though the two distinct species separated c. 9–4.2 million years ago (Palkopoulou et al. 2018), the ancestral traits still connect the two species. We hope scholars studying thanatology come up with detailed anecdotes across various species and perform nuanced comparative thanatological studies to connect the phylogenetic continuity. We encourage science and social science evidence-based thanatological studies for not just sentient beings but also non-sentient beings and less-loved species in a changing natural and socio-political environment.

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Post Mortem Examination Report

Reference: Divisional Forest Officer, Gorumara Wildlife Division, Jalpaiguri, vide letter no. 3329/26-3/2022, Dated 12.09.2022 (Initial verbal contact by the Range Officer, Wildlife Squad III Binnaguri on 12.09.2022 morning for attending the post mortem examination).

History of the case: Carcass of one elephant calf was found and rescued from Devpara T. G. section no. 30, wildlife squad 3, Binnaguri by the R. O. Wildlife squad, Binnaguri. The carcass was found buried partially at dorsal recumbancy and according to the circumstantial evidences it appears that a herd of elephant was present there and they had partially buried the carcass inside the mud.

Description of the Animal: a) ***Species: Elephas maximus***

b) ***Sex:*** F ***c) Age:*** 1 yr (approx..) ***d) Colour:*** Grey ***e) Pole to tail base:*** 1.48 mt ***f) Tail length:*** 0.56 mt

g) Shoulder Height: 1.26 mt ***h) Chest girth:*** 1.56mt ***i) Neck girth:*** 1.08mt

j) Trunk: 0.70mt ***k) Right fore limb foot circumference:*** *0.53 mt*

Date and Time of Detection: 12.09.2022; 11:00am approx.

Date and Time of Post Mortem: 12.09.2022; 4:00 pm onwards.

Place of Post Mortem: Bamni Camp of Gorumara beat under Gorumara south range, Gorumara national Park [N-26°49'48.0" E-088°01'46.7"]

Necropsied by: 1.Dr. Sutrishna Basu, V.O., BAHC, Matiali,Jalpaiguri. 2.Dr. Satyaki Chakraborty, V.O., ABAHC, Maynaguri, Jalpaiguri.

External Examination of the Carcass:

Rigor Mortis: Partially Present **Nutritional Status:** poor

Skin: Shrunken

Eyes: Closed & opaque **Ears:** NAD **Visible Mucous Membrane:** Pale

Internal Examination:

Mouth: NAD

Subcutaneous Tissue: Wide haemorrhages found at the top of the back.

Thoracic Cavity:.

Pleura: Congested **Trachea and bronchi:** NAD **Lungs:** Congested

Heart: Blood filled along with Hydropericardium

Oesophagus: NAD **Diaphragm: NAD**

Abdominal Cavity:

Peritoneum: NAD **Liver: Pale**

Spleen: Pale

Stomach: Filled with undigested feed material **Intestine: Haemorrhagic Catarrhal Enteritis**

Large Intestine &Caecum: Ulcerative foci present **Rectum: Inflammed**

Urinary Organs:

Bladder: Empty **Kidneys:** Mild Congestion

Genital Organs:

Major Findings: Large petechial haemorrhagic lesions found at the dorsal surface of the entire vertebral region.

Materials Collected for Laboratory Examination: ELE/9/1- Portion of Lung, Liver, heart, kidney & spleen in Absolute alcohol for forensic studies. **ELE/9/2-** Portion of Lung, Liver, heart, kidney & spleen in 10% formalin for histopathology.

Conclusion: According to the history and PM findings we can conclude that the above said Elehant calf was dead due to cardio-respiratory failure as a consequence of acute catarrhal enteritis.

V.O., ABAHC
Maynaguri, Jalpaiguri

V.O., BAHC
Matiali, Jalpaiguri

Post Mortem Examination Report

Name and address of sender: Divisional Forest Officer, Gorumara Wildlife Division, Jalpaiguri, vide letter NO: 4040/26-3/2018, Dated: 17/11/2022.

1) Description of animal:

a) **Species:** Asiatic Elephant
b) **Scientific Name:** *Elephas maximus*
c) Wild calf
d) **Sex:** female.
e) **Age:** 1 month approx.
f) **Body Length: Pole to tail base=** 1.22mts.
g) **Tail length:** 0.46 mt.
h) **Chest Girth:** 1.27 mts.
i) **Neck Girth:** 0.79 mt.
j) **Shoulder height:** 0.96 mts.
k) **Pole to Trunk tip length:** 0.57 mt.
l) **Right forefoot circumference-** 0.44mt.

48 Wildlife Squad - III, Binnaguri.

2) **Date and time of detection:** on 17.11.2022 at about 10.20 am. (as reported by the forest personnel).

3) **Date and time of post-mortem:** on 17.11.2022 ,3.00 pm onwards.

4) **Place where animal was detected dead:** Section No- 39 B of Chunabhati Tea Garden under the jurisdiction of the wildlife Squad, Binnaguri of Gorumara Wildlife Division. (26°51′37.5″N, 89°04′21.00″E)

5) **Date and Time of Death:** approximately before 12-14 hours of Postmortem examination.

6) **Place of post-mortem:** Selka-II Compt, Khunia Beat, Gorumara North Range, Gorumara Wildlife Division.

7) **Necropsied By:** 1. Dr. Shweta Mandal, VO, BAHC, Mal service utilized at GNP .Post mortem was conducted in presence of ADFO, Gorumara Wildlife Division and other officials of Forest Department.

8) **Case History:** As reported by the Range Officer, Binnaguri WLS,Gorumara Wildlife Division on 17.11.2022 the carcass of a wild elephant calf was detected about 10.20 am(approx time) stuck inside the drain at Section No- 39 B of Chunabhati Tea garden by the patrolling staff of Binnaguri Wildlife Squad. The elephant calf was found tucked in a drain of the teagarden in dorsal recumbency with head & back totally buried inside the drain and all the four limbs extended upright. The carcass was later on shifted to the Khunia Beat ,Gorumara North Range for post mortem examination.

9) **Rigor Mortis:** passed away.

10) **Eyes:** congested conjunctiva, eyelids swollen.

11) **Ears:** blood tinged fluid coming out of the nostrils.

12) **Other natural orifices:** visible mucous membrane congested.

13) **Other Findings:** The carcass was stuck inside the drain in an abnormal recumbency with its head and back part pressed down inside the drain tightly packed with mud but the hind limbs and forelimbs out of the drain facing upwards. Foot marks of other elephants were noticed in and around the body of the dead calf. There was a bulging of mass in the ventral aspect of the abdomen adjacent to the naval area and a linear scar tissue noticed in the skin over that area.

14) Post Mortem findings:

a) ***Mouth*:** mucous membrane of the mouth congested, tongue soiled with mud and protruded.

b) ***Nasal cavity*:** congested.

BLM 48

BUXA TIGER RESERVE

(VETERINARY UNIT)

POST MORTEM REPORT OF WILD ANIMA

Case no. 18 /Vety/PM of 2022-23 Date: 20.08.22

Species	**Asian Elephant** *(Elephas maximus)*	Case Referred by	DFD, BTR (West)
		Case No.	18/Vety/BTR dated 20.08.22
Age	10 month(approx)	Vide Letter No.	Telephonic communication
Sex	Male	Locality	Vernabari tea Garden, Hemiltanganj Range, BTR (W) Div.
GPS Location at place of Death & place of necropsy (if different)	GPS location at place of death: Lat- 26.764752, Long-89.361850 PM was done at 25 miles Tower, GPS Location N26°39'37" & E89°33'15"		
Captive/Wild	Wild	Habitat	Forest of BTR
Weight	30 quintal (approx)	Weather	Sunny
Ambient Temperature	34°C	Date & Time of death	18-20 hours before P.M
		Date & Time of PM examination	20.08.22 at 1 pm onwards at broad daylight

I. HISTORY OF DEATH/ OUTBREAK

1.History	The carcass was found partially buried with fore & hind leg at upward direction.
2.Clinical Signs before death	unknown
3.Surrounding the carcass	Foot prints of elephant found surround the carcass and over the mud covering the body. Total body including head, trunk tail was found buried except four limb.
4. Other information	Body of the carcass found intact.

II. EXTERNAL EXAMINATION

Body condition index: Total Body Length : 134 cm Chest Girth : 150 cm Neck girth-99cm Tail : 61 cm Height : 97 cm Trunk : 71 cm **Tusk Details : NA** **Right Tusk Details :** 1. Convex Length : 2. Concave Length : 3. Base circumference : 4. Solid Base circumference : 5. Weight : **Left Tusk Details :** 1 Convex Length : 2 Concave Length : 3 Base circumference :	Presence of wound	Contusions present over the body.
	Number of entry wounds	Does no arise
	Description of entry wounds	
	Number of exit wounds	No

Memo No. 445/ED-23

File No. 8/57 2020 WL

Dated, Damanpur, the 30/10/2022

Annexure

Format for Reporting of Death of the Schedule -I and / or Part - II, Schedule - II Listed Species

1	Name of the Species	Indian Elephant
	a) Common Name	Elephant
	b) Scientific Name	*Elephas maximus*
2	No. of Animals reported dead	1 (One)
	a) Male	Yes
	b) Female	NA
3	Location (Please specify details like area, District, within/outside Forest etc.)	Outside the Forest Area, Majherdabri Tea Estate, Section No. - 13 adjacent to NH-31C near kalkut Basty, Cheko Beat, East Damanpur Range, Damanpur, Kalchini, District: Alipurduar. (GPS Location: 26.544368°N, 89.557619°E)
4	Date of Death / Reporting	27/10/2022 & 29/10/2022
5	Probable reasons for death	Asphyxia.
6	Details of Person who reported the incident first	Sri Sujit Kumar Barma, FR, Range Officer, East Damanpur Range
7	Action taken at the Field Level	Reported to the Deputy Field Director, Buxa Tiger Reserve (West)
8	Whether postmortem conducted or not, If yes, details.	Postmortem conducted by Dr. Liton Paul, VO, BTR in presence of Dr. Krishna Mohan, VO, Vulture Conservation Centre, Rajabhatkhawa, Dr. Nabi Kanta Jha, WBFS, ADFO, BTRW, Sri Sujit Kumar Barma, FR, RO/EDPO Range. Body Measurement was taken. After a thorough checking of the Carcass, Body was opened and Samples taken by Veterinary Doctors and burnt as instructed by the Veterinary Doctors.
9	Peliminary findings	Stumbled inside the trench of the Tea Garden and run over by a herd of the Elephants and died due to Asphyxia.
10	FIR lodged, if any (Details)	NA.
11	Details of missing body parts, if any	No.
12	Any other related information	NA

Name: Sri Sujit Kumar Barma

Designation: Forest Ranger

Signature

Date: 29/10/2022

POST MORTEM REPORT OF WILD ANIMAL

Case no. Vety/PM

Date: 26.10.2023

Species	Elephant *(Elephas maximus)*	Case Referred by	DFO, Gorumara Wildlife Division
Age	3-4 months(Approx)	Vide Letter No.	Letter no -5037/26-3/2023,dt. 30.10.23 of DFO, Gorumara Wildlife Division
Sex	female	Locality	Carcass detected in one of the drains in between Section 58 and 59 inside New Dooars Tea Garden.
GPS Location at place of Death & place of necropsy (if different)	Location where the animal was found dead.(**N 26°50′30.2′′E 089°02′56′′**) Post Mortem was conducted in forest areas of Selka-I Compt,Khunia Beat, GNR.		
Captive/Wild	Wild	Date & Time of Death or found dead	Detected on 26.10.2023 at about 09.30 am. Death appeared to have occurred approximately 10-12 hours prior to post mortem examination time.
Ambient Temperature	33° C		
Habitat	Forests		
Weather	sunny		
Weight	Not taken	Date and time of PM Examination	26.10.2023 2.0 pm onwards

I HISTORY OF DEATH/OUTBREAK

1.Brief History	As per history of the Forest Officials on 26.10.2023 at about 09.30 am. carcass of a wild elephant calf was detected by the patrolling staff of Binnaguri WLS inside the New Dooars Tea Garden in one of the drains in between Section 58 and 59 The carcass was found lying in dorsal recumbency with trunk, mouth and the dorsal part of the body except the four limbs buried inside the drain. The carcass was lifted from the spot of detection and shifted to Selka-I Compatrment of Khunia Beat,Gorumara North Range. Post mortem was conducted from 2.00 pm onwards.
2.Clinical Signs before death	Not seen
3.Observation of the Surroundings of the carcass	The carcass was buried inside the drain which was approximately 0.95 mt deep and 0.50 mt wide except in that region where the calf was lying. That area appeared to be filled freshly with mud and the edges of the drain were distorted and widened and the nearby ground messed with mud. It was found in an abnormal recumbency with its entire back, head, trunk, neck and body pressed down inside the drain tightly packed with mud but all the four limbs and a portion of the ventral aspect of the abdomen out of the drain facing upwards. There was a bulging of mass in the ventral aspect of the abdomen adjacent to the naval area and a linear scar tissue noticed in the skin over that area.
4.Other relevant information	Foot marks of other elephants were noticed in and around the body of the dead calf.

II.EXTERNAL EXAMINATION

Body Condition Index Body physical parameter measured as mentioned-	Presence of Wound	No external injury seen
	Number of entry wound	_____
	Description of entry wounds	_____

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