

Vulture scavenging in the Lowveld of South Africa and the implications for forensic investigations

Craig A. Keyes¹, PhD;
Jolandie Myburgh², PhD;
Desiré Brits, PhD³

¹Department of Forensic Medicine and Pathology, School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

²Department of Anatomy, School of Medicine, Faculty of Health Sciences, University of Pretoria, South Africa

³Human Variation and Identification Research Unit, School of Anatomical Sciences, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa



Introduction

- The quantity of forensic evidence available to forensic investigators for analysis is determined by the holistic recovery of scattered, scavenged remains.
- The scattering pattern of elements from their original site of deposition has been shown to be specific to different scavenging animals.⁵
- South African research on animal scavenging and scattering behaviours in a forensic context is lacking with only a few published studies in South Africa.¹⁻⁴
- The white-backed vulture, lappet-faced vulture, and hooded vulture are all common scavengers in the Lowveld of South Africa and they could have serious implications on forensic investigations.⁶
- This study describes the behavior and scattering patterns of these vultures collectively, as well as their modifications to bone.



Methods

Scavengers:

- The scavenging behaviours of wild white-backed, hooded, and lappet-faced vultures were studied.

Study site:

- The Wits Rural Facility (WRF) is a rural campus of the University of the Witwatersrand, situated near the border of the Kruger National Park game reserve.
- The WRF is a 315 hectare estate of savannah woodland in the central Lowveld of the Limpopo Province of South Africa.

Sample:

- 10 domestic pig carcasses (*Sus scrofa domesticus*) weighing between 40-80kg.
- The pigs were placed at least 50m apart from each other.



White-backed vulture



Hooded vulture



Lappet-faced vulture

Results

- Overall, vulture scavenging resulted in the rapid **skeletonization** of the pig carcasses **between 5 - 98 minutes**.
- The onset of vulture scavenging was impacted by the location of the pig deposition in relation to fences (Figure 1).
 - Vulture scavenging was **delayed** in carcasses near **fences**.
 - It is assumed that this is a learned behaviour, as vultures avoid potentially electrified cables.
- Vultures arrived at a carcass and scavenged **faster in summer than in winter** (Figure 1).

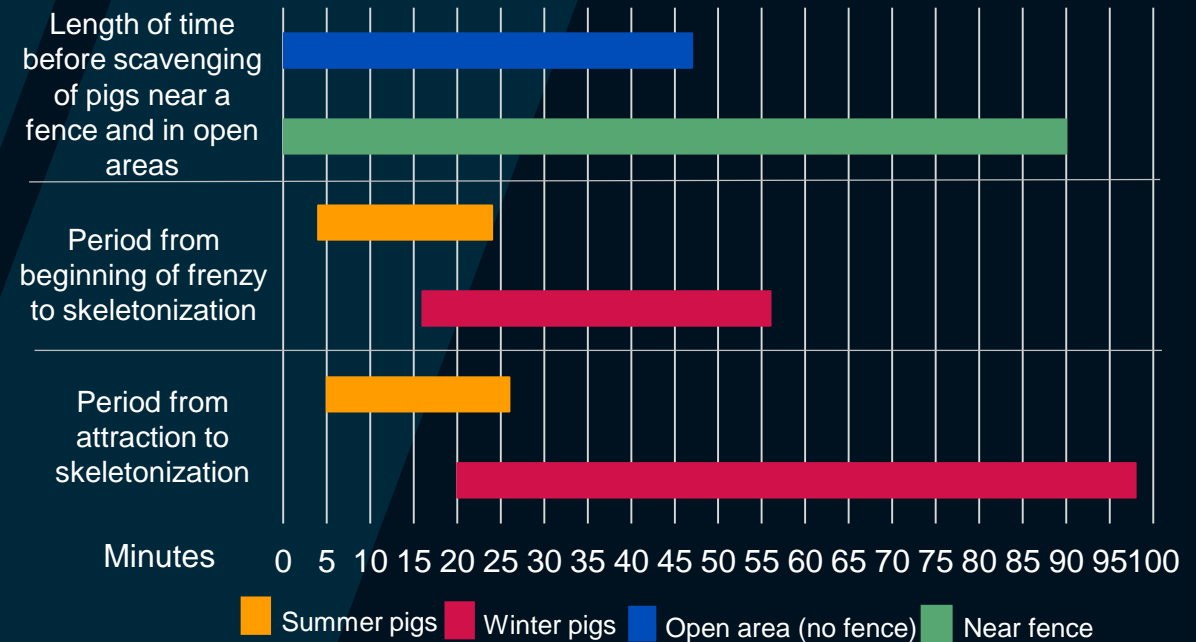
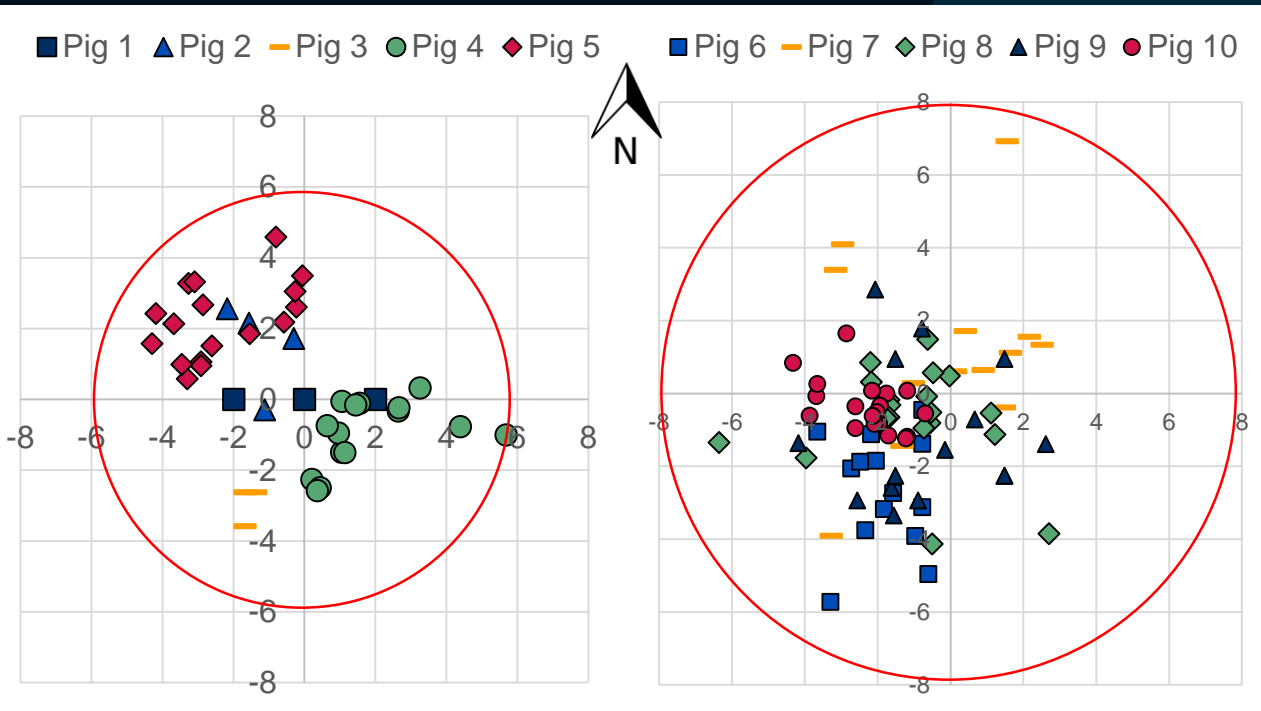


Figure 1: The range of time taken for vultures to begin scavenging and skeletonize pig carcasses in summer and winter

Results



- Overall, the skeletal remains were scattered within a circular area of $157.9\text{m}^2/1705.5\text{ft}^2$, with a radius of $7.09\text{m}/23.3\text{ft}$.
- The scatter pattern in **winter** was more **dense** than the more **diffuse** pattern in **summer** (Figure 2).

Figure 2: Scatter plot of the skeletal elements of ten pigs, five in **winter (left)** and five in **summer (right)**, scattered primarily by vultures, showing distance (in meters) and direction of scattering. The origin (0;0) indicates the original position of each pig. The compass arrow indicates the relative scatter direction. Circles indicate the scatter radius (summer radius = 7.09m ; winter radius = 5.7m with one outlying element scattered beyond this radius not included in the figure)

Results

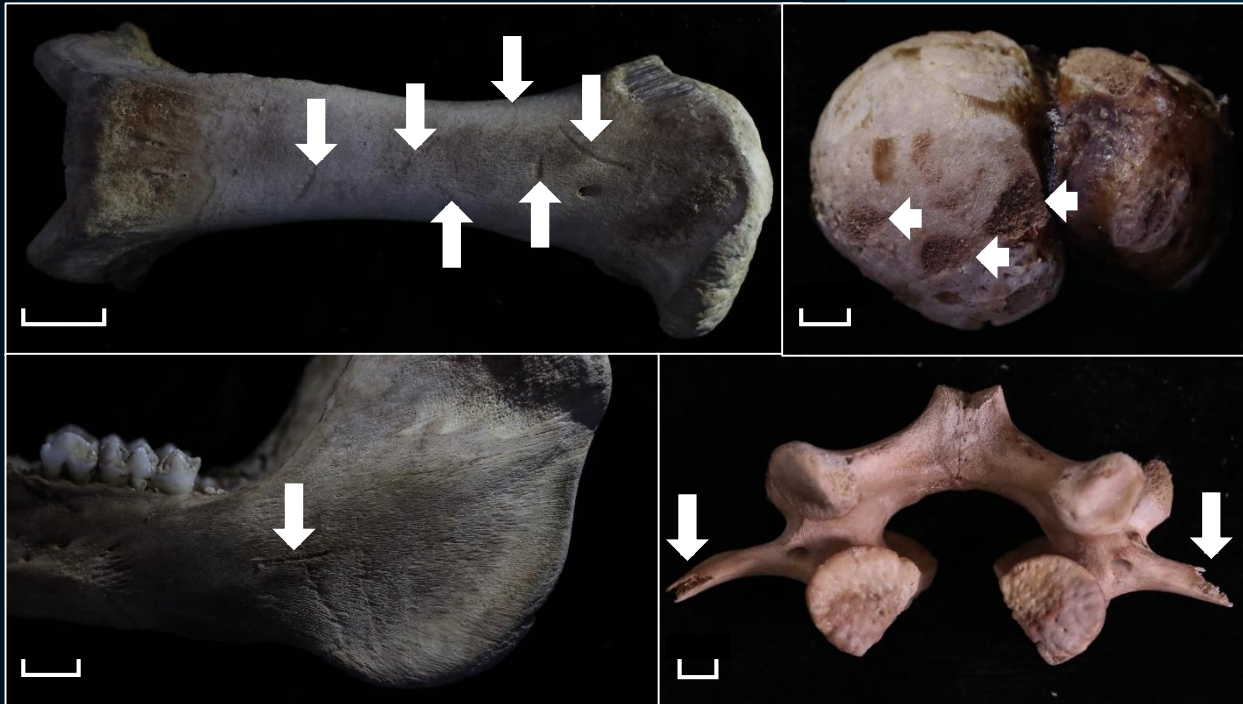


Figure 3: Vulture bite marks pointed out by arrows in the form of scores on the femur (top left) and mandible (bottom left), pits on the head of humerus (top right), and fractured transverse process on vertebrae (bottom right). Scale represents 10mm.

- Vulture scavenging left **very few** marks on the bones; comprised of mainly **superficial, nonspecific** scores.
- The markings were isolated to superficial **scores** on the **flat surfaces** of the cranium, mandible, scapulae, and long bones (Figure 3).
- The distal ends of the **transverse processes** of the vertebrae were often broken off (Figure 3).
- Large superficial pits were noted on the **head of the humerus** in one case (Figure 3).

- The vultures in the present **South African** study scavenged and skeletonized remains **faster than** those studied in **Texas, USA**.⁷⁻⁸
- The more **diffuse** and **larger scatter area** in summer could be due to **larger vulture groups** which are active in summer.
- The minimal and superficial **scavenging marks** on bone were most likely caused by the **vultures' beaks** and not their claws. Beak marks on bone surfaces can be differentiated from claw and bite marks.⁷
- Scores caused by vulture beaks are irregular and more similar to root etching which **prevents** their **misinterpretation as sharp force trauma**.⁷
- The description of scattering patterns will assist in a **more holistic collection** of scattered remains in the future, and the **accurate interpretation** of the taphonomic bone modifications due to vulture scavenging.

Discussion



References

1. Spies MJ, Finaughty DA, Gibbon VE. Forensic taphonomy: Scavenger-induced scattering patterns in the temperate southwestern Cape, South Africa—A first look. *Forensic Science International*. 2018;290:29-35.
2. Spies MJ, Gibbon VE, Finaughty DA. Forensic taphonomy: Vertebrate scavenging in the temperate southwestern Cape, South Africa. *Forensic Science International*. 2018;290:62-9.
3. Keyes CA, Myburgh J, Brits D. Taphonomic bone trauma caused by Southern African scavengers. *International Journal of Legal Medicine*. 2019;134(3):1227-38.
4. Keyes, C.A., Myburgh, J. and Brits, D., 2020. Scavenger activity in a peri-urban agricultural setting in the Highveld of South Africa. *International Journal of Legal Medicine*.
5. Reeves NM. Taphonomic effects of vulture scavenging. *Journal of Forensic Sciences*. 2009;54(3):523-8.
6. Kemp A, Kemp M. Observations on the White-backed Vulture *Gyps africanus* in the Kruger National Park, with notes on other avian scavengers. *Koedoe*. 1975;18(1):51-68.
7. Reeves NM. Taphonomic effects of vulture scavenging. *Journal of Forensic Sciences*. 2009;54(3):523-8.
8. Spradley MK, Hamilton MD, Giordano A. Spatial patterning of vulture scavenged human remains. *Forensic Science International*. 2012;219(1-3):57-63.

This study was funded by the National Institute of Justice and the Forensic Technology Center of Excellence and American Academy of Forensic Sciences Humanitarian and Human Rights Resource Centre.