

Introduction

- Forensic entomology is a specialized field that is centrally focused on the estimation of the minimum post-mortem interval (PMI_{min}) of deceased individuals using cadaver-associated insect evidence (1, 2).
- The decomposition processes of cadavers are strongly influenced by several environment-specific biotic and abiotic factors (3).
- Prior to employing insects in PMI_{min} estimation, it is crucial to first establish baseline data on the insect community associated vertebrate remains across various decomposition stages and seasons (1, 2).
- This is achieved by conducting locality- and region-specific forensic entomological and decomposition studies (1, 2).
- No previous study exist on the entomofauna associated with decomposing vertebrate remains in the Table Mountain region of the the Western Cape Province of South Africa.

AIM: Establish baseline data on the entomofauna associated with a decomposing adult pig carcass in the Table Mountain National Park, Western Cape Province.

Materials and Methodology

- This study was conducted within the area of Table Mountain National Park, Cape Town, South Africa (S33°57.666'; E018°27.331') between December 2022 to January 2023.

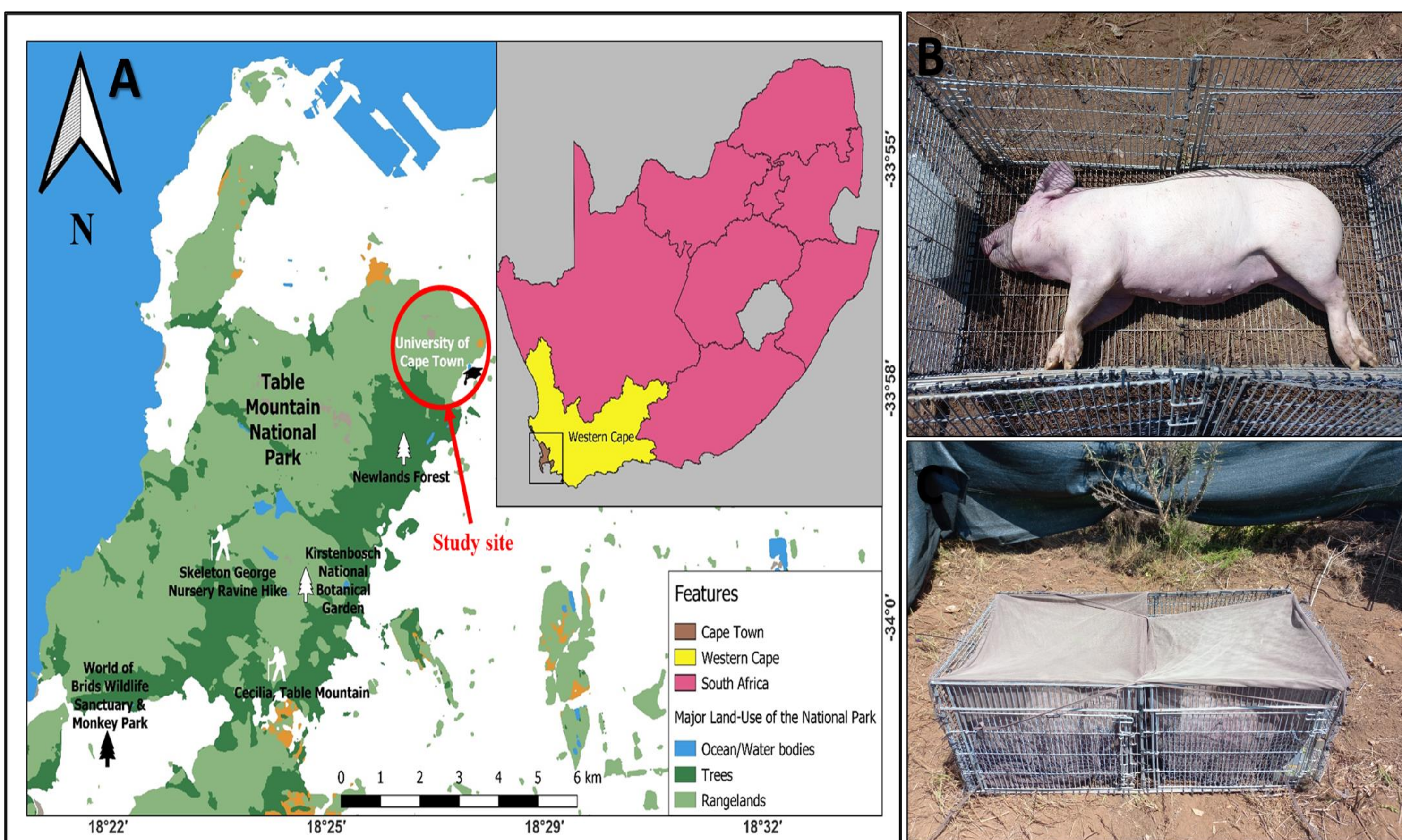


Figure 1: Map of South Africa showing the City of Cape Town within the Western Cape Province (top right), and the study site within the Table Mountain National Park highlighted by the red circle and arrow (center left) (A). Close up view of the adult pig carcass in the experimental cage (B), double tent-like brown net hanging above the pig carcass within the experimental cage (C).

- One adult pig carcass (~60kg) was used for the trial as an international proxy for a human cadaver (UCT FHS Animal Ethics Number: 021_021).
- The trial commenced on the 15th of December 2022 and was terminated on the 2nd of January 2023.
- Adult and immature insect life stages were collected using a fly netting and manual sampling and identified using published identification keys/descriptions (2, 4).
- Decomposition of the carcass was tracked daily using the Total Body Scoring (TBS) system for pigs developed by Keough *et al.* (5).
- Daily weather data were recorded using weather data loggers and station.
- Accumulated Degree Days (ADD) was calculated by summing the daily average temperatures.

Results

Weather data

- Overall daily mean carcass external and ambient temperatures were 24.9°C and 20.7°C respectively. Overall daily mean ambient relative humidity and rainfall were 68.4% and 0.9mm respectively.

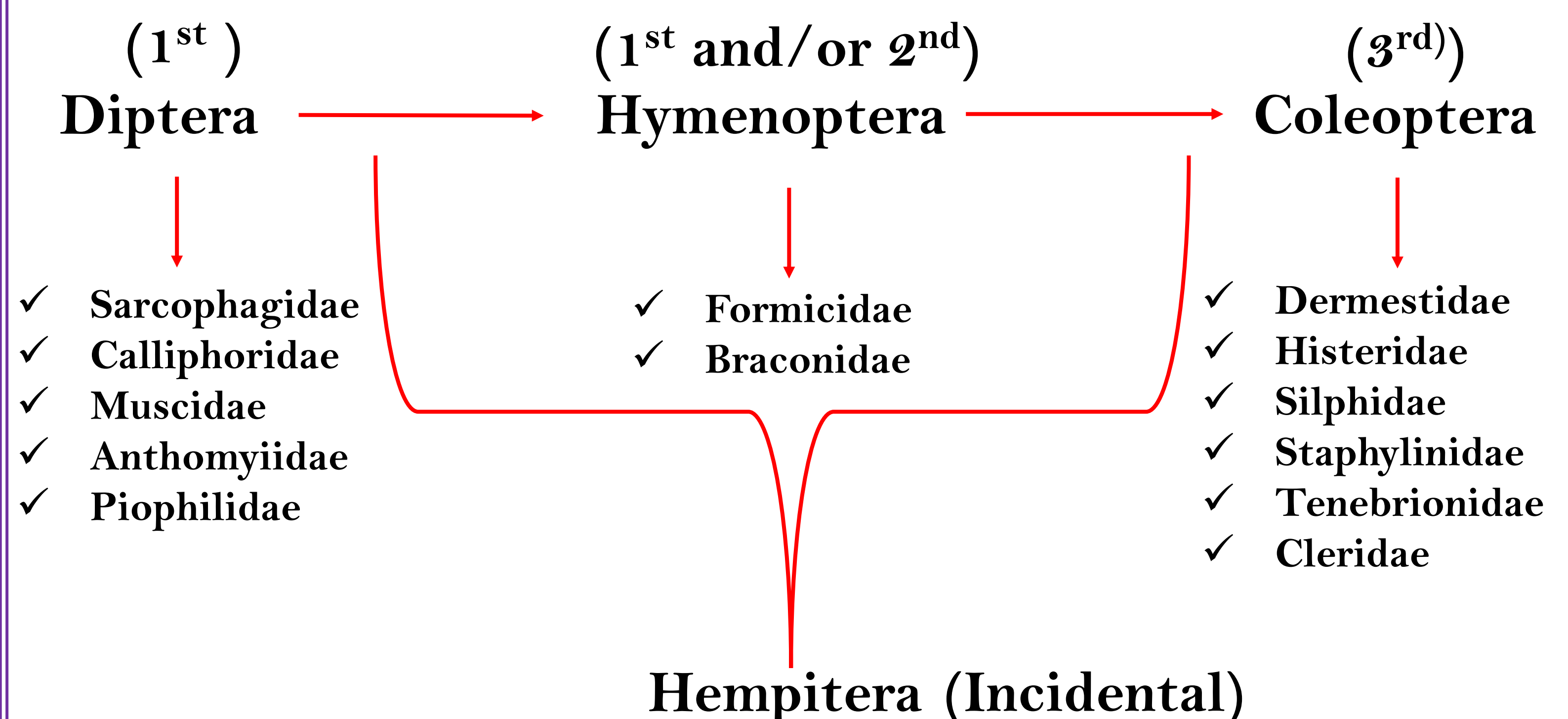
Decomposition data



Figure 2: Fresh: ≤ Day 1 (ADD = ≤ 26.5) (A), Early decomposition: Days 1 – 5 (ADD on Day 1 = 26.5) (B), Advanced decomposition: Day 6 (ADD on Day 6 = 139.4) (C), Skeletonization: Day 8 – 18 (ADD on Day 8 = 193.6) (D).

Insect data

Summarized insect successional pattern



Most abundant insect colonizers and breeders on the pig carcass

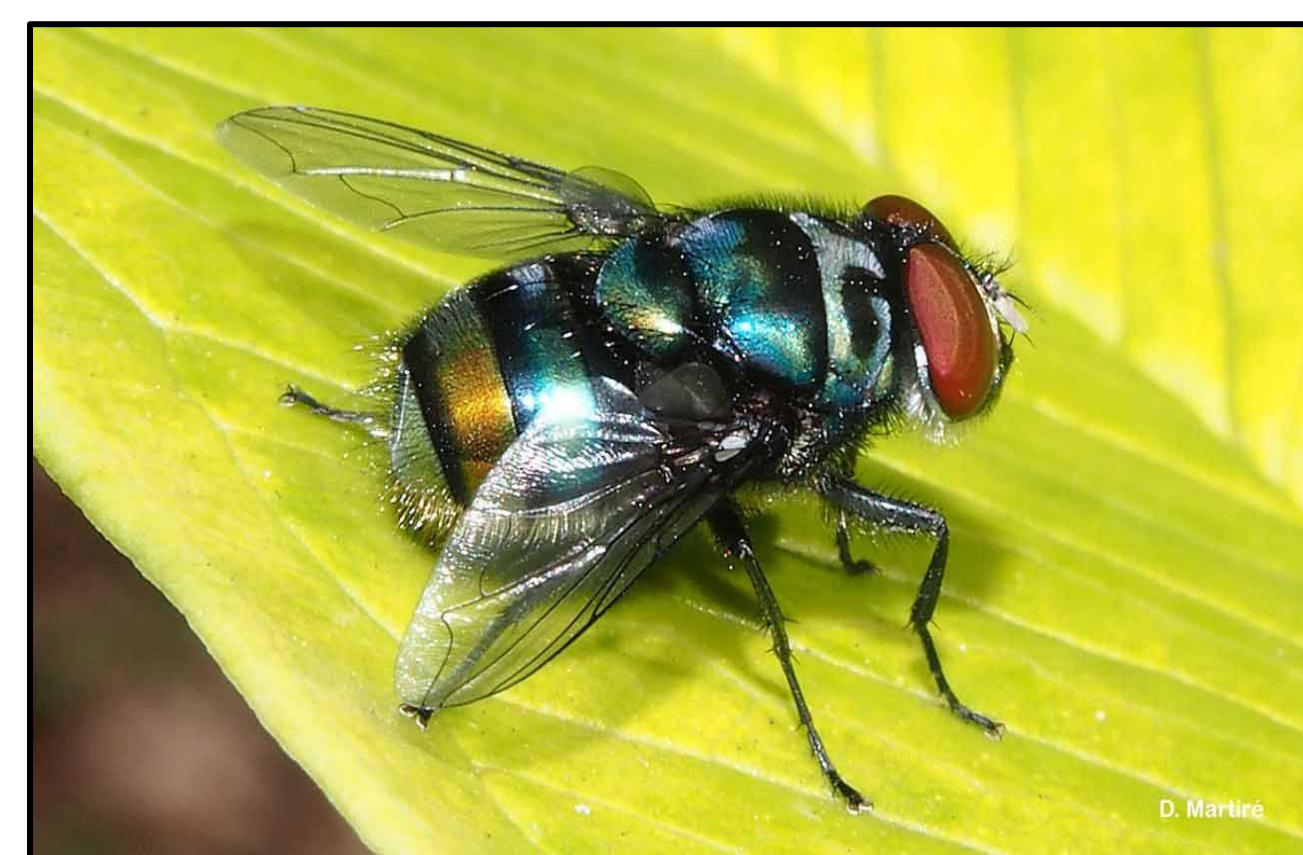


Figure 3: *Chrysomya chloropyga* (Weidemann, 1818)



Figure 4: *Chrysomya albiceps* (Weidemann, 1819)



Figure 5: Dermestidae gen. sp.



Figure 6: Histeridae gen. sp.

Discussion

- It took **8 Days** for the pig carcass to transition into the skeletonization stage.
- Rapid decomposition of vertebrate remains in the summer season has been reported in other areas in South Africa (6 – 8).
- The advanced decomposition and skeletonization stages attracted significantly higher numbers of insect species and individuals.
- Similar to other studies in South Africa (6 – 8), *Ch. chloropyga* and *Ch. albiceps* were the most abundant flies and they were the only flies that bred on the carcass in this study.
- Similar to the summer findings of Finaughty (8), members of the family **Dermestidae** were the only beetle that bred on the pig carcass.

Conclusion

- The result of this study revealed that a cadaver weighing ~60kg can become skeletonized with dried skin within **8 Days** in the summer season of the Table Mountain region.
- Chrysomya chloropyga*, *Ch. albiceps* and members of the family **Dermestidae** are the insects of forensic importance in the summer season of the Table Mountain region.
- These three insect species can be used in PMI_{min} estimation in this region of the Western Cape Province.

References

- Amendt, J., Krettek, R. and Zehner, R. (2004). Forensic entomology. *Naturwissenschaften*. 91: 51 – 65.
- Byrd, J. and Castner, J. L. (2010). *Forensic Entomology: The Utility of Arthropods in Legal Investigations*. 2nd Ed. Boca Raton-London-New York: CRC Press.
- Campobasso, C. P., Di Vella, G. and Introna, F. (2001). Factors Affecting Decomposition and Diptera Colonization. *Forensic Science International*. 120: 18 – 27.
- Latz, L., Williams, R. A., Villet, M. H., Ekanem, M. and Septh, R. (2018). Species identification of adult African blowflies (Diptera: Calliphoridae) of forensic importance. *International Journal of Legal Medicine*. 132(5): 891 – 892.
- Keough, N., Myburgh, J. and Steyn, M. (2017). Scoring of decomposition: a proposed amendment to the method when using a pig model for human studies. *Journal of Forensic Sciences*. 62: 986 – 993.
- Kelly, J. A. (2006). The influence of clothing, wrapping and physical trauma on carcass decomposition and arthropod succession in central South Africa. Ph.D. Thesis, University of the Free State, South Africa.
- Gilbert, A. E. (2014). Forensic Entomology on the Gauteng Highveld. MSc. Thesis, University of Witwatersrand, South Africa.
- Finaughty, D. A. (2019). The establishment of baseline data on the rates and processes of soft-tissue decomposition in two terrestrial habitats of the Western Cape, South Africa. Ph.D. Thesis, University of Cape Town, South Africa.
- Figure 3: <https://www.angoras.co.za/article/fly-strike-myiasis-frommers-on-30/08/2023> (Date accessed)
- Figure 4: https://species.wikimedia.org/wiki/Chrysomya_albiceps#/media/File:Chrysomya_albiceps.jpg (Date accessed)
- Figures 5 and 6: Byrd, J. and Castner, J. L. (2010). *Forensic Entomology: The Utility of Arthropods in Legal Investigations*. 2nd Ed. Boca Raton-London-New York: CRC Press.

Acknowledgements

- The University of Cape Town and National Research Foundation, South Africa for funding the research and A.D.A's academic programme.
- South African National Park and Table Mountain National Park for the permission to conduct the study within the vicinity of the Table Mountain National Park.
- Mr. John Morris, Mariensdahl Experimental Farm, Stellenbosch University for the provision of the adult pig
- Dr Susan Cunningham of the FitzPatrick Institute of Ornithology and Dr Piotr Wolski of the Climate Research Group, both of the University of Cape Town for granting us access to their weather data database from which the weather data presented in this study were obtained.