

Possible predator avoidance behaviour of hominins in South Africa

AUTHOR:

Shaw Badenhorst¹

AFFILIATION:

¹Evolutionary Studies Institute, University of the Witwatersrand, Johannesburg, South Africa

CORRESPONDENCE TO:

Shaw Badenhorst

EMAIL:

shaw.badenhorst@wits.ac.za

KEYWORDS:

Paranthropus robustus;
Aepyceros melampus;
Papio ursinus; australopithecine;
human ancestors

HOW TO CITE:

Badenhorst S. Possible predator avoidance behaviour of hominins in South Africa. S Afr J Sci. 2018;114(7/8), Art. #a0274, 2 pages. <http://dx.doi.org/10.17159/sajs.2018/a0274>

PUBLISHED:

30 July 2018

There are many factors that contribute to the evolutionary success of species¹, for example, species often develop elaborate predator avoidance behaviour². Such behaviours can be studied by ethologists in extant animals³, but supporting empirical evidence is often lacking for such behaviours in extinct organisms⁴. Using living animals as proxies for extinct species usually allows for behavioural analogies, such as the use of baboon behaviour to infer the behaviour of our human ancestors and relatives.⁵ South Africa is inhabited by a large primate, the chacma baboon (*Papio ursinus*). Baboons are comparable in size and weight to australopithecines like *Paranthropus robustus* and *Australopithecus africanus* and their human-like behaviour has long been recognised.^{5,7-11}

Our understanding of the evolution of hominins is largely based on direct evidence from skeletal remains (gait, brain size, mobility, diet, etc.) and material culture (bone and stone tools), and very little is known about their behaviour. *Paranthropus robustus* was a robust australopithecine that lived between 2 and 1.2 million years ago in South Africa and remains of this species have been found at sites like Kromdraai, Swartkrans, Drimolen, Gondolin and Cooper's Cave in the Cradle of Humankind.¹² In the main, *Paranthropus robustus* was small statured but bipedal¹³ and followed a patrilocal form of residence¹⁴. They were dietary generalists.¹⁵ Apart from these main lines of evidence, very little is known about the behaviour of *Paranthropus robustus* during the Early Pleistocene.

From an evolutionary ecological perspective, prey species develop mechanisms to avoid being caught by predators. These anti-predatory devices are varied in animals and behavioural and anatomical adaptations may include a combination of sound, smell, colour, pattern, form, posture and/or movement devices.² Natural selection promotes the evolution in prey animals of features that reduce the probability of success for their predators. Animals with such anti-predatory devices tend to have a higher probability of escaping predation than animals without them.¹⁶ Today, lions (*Panthera leo*) and leopards (*Panthera pardus*) are the main predators of baboons. Lions stalk baboons during daytime when they feed on the ground, and leopards attack them during the night.¹⁷ Baboons have evolved numerous predatory avoidance behaviours to counter these attacks to ensure survival. The main behaviours include living in large troops, moving in a patterned way on the landscape⁵, using sentries (elderly male individuals to sound alarms and defend the troop), sleeping in inaccessible places at night¹⁸ and stone throwing¹⁹.

Baboons also display another form of predatory avoidance behaviour: they are often found, during daytime, with other animals including buffalo (*Syncerus caffer*), elephant (*Loxodonta africana*)²⁰, bushbuck (*Tragelaphus scriptus*), rock hyraxes (*Procavia johnstoni*), tree hyraxes (*Heterohyrax brucei*)²¹, guinea fowls (*Numida meleagris*), blue duiker (*Philantomba monticola*)⁹, and, most often, with impala (*Aepyceros melampus*). The visual powers of baboons complement the acute sense of smell of impala, allowing for their mutual protection from predators.^{14,17,22-27} Washburn and De Vore¹¹ found that olive baboons (*Papio anubis*) are closely associated with impala in open country, while in forested areas, they associate with bushbuck. The bark of these two antelope species will set a troop of baboons to flight, and a mixed herd of baboons and impalas are almost impossible to take by surprise.¹¹ Impala have the ability to distinguish between the alarm and contest calls of chacma baboons.²⁸ Both species are found in similar environments, and both are preyed upon by lions and leopards.²⁹

It is likely that hominins employed similar behaviour by associating themselves with medium and large ungulates during daytime, especially before the controlled use of fire, which would have enabled them to successfully survive for several hundreds of thousands of years. However, testing this proposed association is challenging. For example, using a simple presence-absence approach with respect to medium to large Bovidae and Equidae faunas associated with *Paranthropus robustus*³⁰⁻³³ from the Cradle of Humankind does not reveal any significant absence of species (Figure 1). An absence or lower occurrence of species may indicate successful anti-predator behaviour, although sample size and taphonomic history^{34,35} are also important considerations.

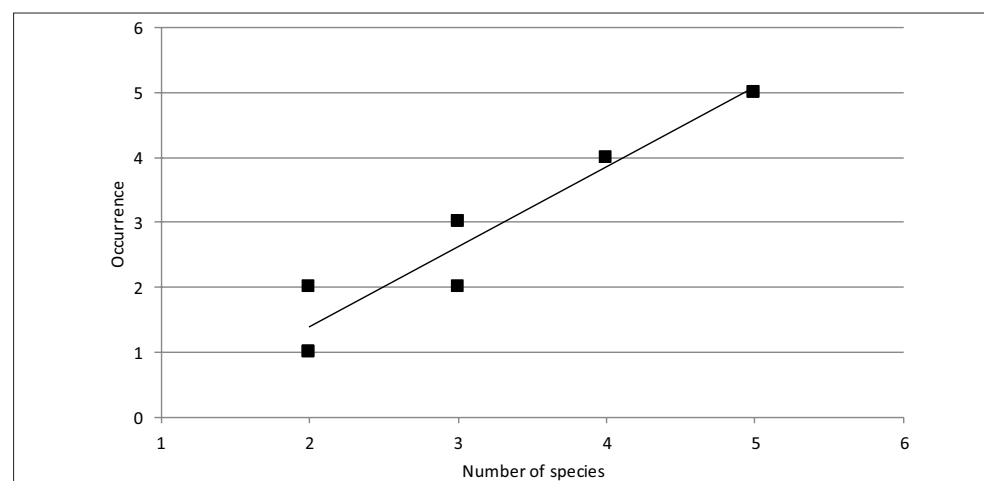


Figure 1: The number of medium and large Bovidae and Equidae species and occurrences at Kromdraai B, Sterkfontein Member 5, Swartkrans Members 1, 2 and 3, Drimolen and Cooper's D Cave. Trend line indicated.

Impalas are the perfect ungulates for primates such as the chacma baboon to associate themselves with during daytime. In addition to their acute ability to sense predators, impalas prefer woodland savanna, rarely wander more than 2 km from permanent water, and are sedentary, in that they move less than 3 km per day within their home range.⁶ During Plio-Pleistocene times, it is possible that hominins such as *Paranthropus robustus* and *Australopithecus africanus* as well as other primates associated themselves with ungulates with similar characteristics. The extinct *Gazella helmoedi* is thought to be an ancestral local form of the extant impala *Aepyceros melampus*.^{36,37}

Novel approaches are required to investigate these likely associations between hominins and ungulates to reveal more about the evolution and behaviour of our human ancestors and their relatives. For example, a consideration of the predators, feeding and water requirements, habitat preference, distribution, herd size, home ranges, and anti-predator behaviour of ungulates can potentially reveal behavioural aspects of hominins like *Paranthropus robustus* and *Australopithecus africanus* to complement research on skeletal elements.

References

1. Jezkova T, Wiens JJ. What explains patterns of diversification and richness among animal phyla? *Am Nat.* 2017;189(3):201–212. <https://doi.org/10.1086/690194>
2. Pianka ER. *Evolutionary ecology*. New York: Addison Wesley Longman Inc.; 2000.
3. Lehner ON. *The handbook of ethological methods*. Cambridge, UK: Cambridge University Press; 1996.
4. Benton MJ. Studying function and behavior in the fossil record. *PLoS Biol.* 2010;8(3), e1000321, 5 pages. <https://doi.org/10.1371/journal.pbio.1000321>
5. De Vore I, Washburn SL. Baboon ecology and human evolution. In: Howell FC, Bourlière F, editors. *African ecology and human evolution*. Chicago, IL: Aldine Publishing Company; 1966. p. 335–367.
6. Rautenbach IL. *Mammals of the Transvaal*. *Ecoplan Monograph No. 1*. Pretoria: Ecoplan; 1982.
7. Marais EN. *Burgers van die berge [Citizens of the mountains]*. Pretoria: JL van Schaik; 1938. Afrikaans.
8. Marais EN. *The soul of the ape*. Pretoria: Human & Rousseau; 1969.
9. Bolwig N. A study of the behaviour of the chacma baboon, *Papio ursinus*. *Behaviour.* 1959;14(1–2):136–163. <https://doi.org/10.1163/156853959X00054>
10. De Vore I. *The social behavior and organisation of baboon troops* [PhD thesis]. Chicago, IL: University of Chicago; 1962.
11. Washburn SL, De Vore I. The social life of baboons. *Sci Am.* 1961;204:62–71. <https://doi.org/10.1038/scientificamerican0661-62>
12. Herries AIR, Curnoe F, Adams JW. A multi-disciplinary seriation of early *Homo* and *Paranthropus* bearing palaeocaves in southern Africa. *Quat Int.* 2009;202:14–28. <https://doi.org/10.1016/j.quaint.2008.05.017>
13. Klein RG. *The human career: Human biological and cultural origins*. Chicago, IL: University of Chicago Press; 1999.
14. Copeland SR, Sponheimer M, De Ruiter DJ, Lee-Thorp JA, Codron D, Le Roux P, et al. Strontium isotope evidence for landscape use by early hominins. *Nature.* 2011;474:76–78. <https://doi.org/10.1038/nature10149>
15. Wood B, Strait D. Patterns of resource use in early *Homo* and *Paranthropus*. *J Hum Evol.* 2004;46(2):119–162. <https://doi.org/10.1016/j.jhevol.2003.11.004>
16. Greenwood JJD. The evolutionary ecology of predation. In: Shorrocks B, editor. *Evolutionary ecology*. Oxford: Blackwell Scientific Publications; 1984. p. 233–273.
17. Busse C. Leopard and lion predation upon chacma baboons living in the Moremi Wildlife Reserve. *Botsw Notes Rec.* 1980;12:15–21.
18. Stevenson-Hamilton J. *Wild life in South Africa*. London: Cassell and Company; 1947.
19. Raven-Hart R. *Cape Good Hope 1652-1702. The first fifty years of Dutch colonisation as seen by callers*. Cape Town: A. A. Balkema; 1971.
20. Skinner JD, Chimimba CT. *The mammals of the southern African subregion*. Cambridge, UK: Cambridge University Press; 2005. <https://doi.org/10.1017/CBO9781107340992>
21. Davis BR, Ebersole JJ. Impala (*Aepyceros melampus*) associate with olive baboons (*Papio anubis*) for feeding and security in Tarangire National Park, Tanzania. *Afr J Ecol.* 2015;54:238–241. <https://doi.org/10.1111/aje.12263>
22. Pfeiffer JE. *The emergence of man*. London: Harper & Row Publishers; 1969.
23. Stevenson-Hamilton J. *The Low-veld: Its wild life and its people*. London: Cassell and Company; 1934.
24. Bigalke R. *What animal is it?* Pretoria: The Trustees of the South African Bird Book Fund and The Mammals of South Africa Book Fund; 1958.
25. Altmann SA, Altmann J. *Baboon ecology*. Chicago, IL: University of Chicago Press; 1970.
26. Morgan-Davies AM. The association between impala and olive baboon. *J East Afr Nat Hist Soc.* 1960;23:297–298.
27. Baenninger R, Estes RD, Baldwin S. Anti-predator behaviour of baboons and impalas toward a cheetah. *E Afr Wildl J.* 1977;15:327–329. <https://doi.org/10.1111/j.1365-2028.1977.tb00414.x>
28. Kitchen DM, Bergman TJ, Cheney DL, Nicholson JR, Seyfarth RM. Comparing responses of four ungulate species to playbacks of baboon alarm calls. *Anim Cogn.* 2010;13:861–870. <https://doi.org/10.1007/s10071-010-0334-9>
29. Cowlishaw G. Vulnerability to predation in baboon populations. *Behaviour.* 1994;131:293–304. <https://doi.org/10.1163/156853994X00488>
30. Brain CK. *The hunters or the hunted? An introduction to African cave taphonomy*. Chicago, IL: University of Chicago Press; 1981.
31. De Ruiter DJ. Revised faunal lists for Members 1-3 of Swartkrans, South Africa. *Ann Transv Mus.* 2003;40:29–41.
32. Adams JW, Rovinsky DS, Herries AIR, Menter CG. Macromammalian faunas, biochronology and palaeoecology of the early Pleistocene Main Quarry hominin-bearing deposits of the Drimolen Palaeocave System, South Africa. *PeerJ.* 2016;4, e1941, 46 pages. <https://doi.org/10.7717/peerj.1941>
33. De Ruiter DJ, Pickering R, Steininger CM, Kramers JD, Hancox PJ, Churchill SE, et al. New *Australopithecus robustus* fossils and associated U-Pb dates from Cooper's Cave (Gauteng, South Africa). *J Hum Evol.* 2009;56(5):497–513. <https://doi.org/10.1016/j.jhevol.2009.01.009>
34. Driver JC. Identification, classification and zooarchaeology. *Circaea.* 1991;9(1):35–47.
35. Grayson DK. *Quantitative zooarchaeology: Topics in the analysis of archaeological fauna*. London: Academic Press; 1984.
36. Brink JS. *The evolution of the black wildebeest, *Connochaetes gnou*, and modern large mammal faunas in central southern Africa* [PhD thesis]. Stellenbosch: Stellenbosch University; 2005.
37. Brink JS, Herries AIR, Moggi-Cecchi J, Gowlett JAJ, Bousman CB, Hancox JP, et al. First hominine remains from a ~1.0 million year old bone bed at Cornelia-Uitzhoek, Free State Province, South Africa. *J Hum Evol.* 2012;63:527–535. <https://doi.org/10.1016/j.jhevol.2012.06.004>

