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PROGRESS REPORT ON FIELD WORK FOR PERMIT 80/10/08/009/60

My current research involves the study of life history variation in response to environmental perturbation. The end-Permian mass extinction, which occurred approximately 252 million year ago, is used as a model for assessing differential species survival during a mass extinction. I use several tools to study the palaeobiology and palaeoecology of vertebrates associated with the end-Permian extinction, including biostratigraphy, morphology and bone histology. My specific objectives are to conduct field excursions to known Permo-Triassic boundary sites and to find new sites, to assess the biostratigraphy of these sites, find new species, and assess the changes in growth strategies across the Permo-Triassic boundary.

One field expedition was conducted in October 2012 to several districts in the Free State that contain Upper Permian, Lower and Middle Triassic strata. The districts included the Dewetsdorp, Wepener, Thaba N'Chu, Paul Roux and Kestell districts and fossils were collected from the farms Bokpoort in the Wepener District, Rietpoort in the Dewetsdorp District, Kildare in the Thaba N'Chu District, and Langberg and Virginia in the Paul Roux District. We were given permission to search a Middle Triassic locality in the Golden Gate National Park, which involved submitting a separate application to search the locality. However, no fossils were found.

Collection methodology involves prospecting sites that contain sediments with the potential to hold fossils, i.e. sedimentary facies consisting of mudrock. A specimen is photographed while still in the ground (prior to excavation), and information regarding the specimen is recorded in a field book, i.e. date, farm name, geological formation, geological time period, biostratigraphic zone, possible identification, description of specimen, GPS co-ordinates (if in situ), name of fossil finder. The specimens are re-examined on returning to the laboratory, and if deemed identifiable, are then given National Museum accession numbers (NMQR).

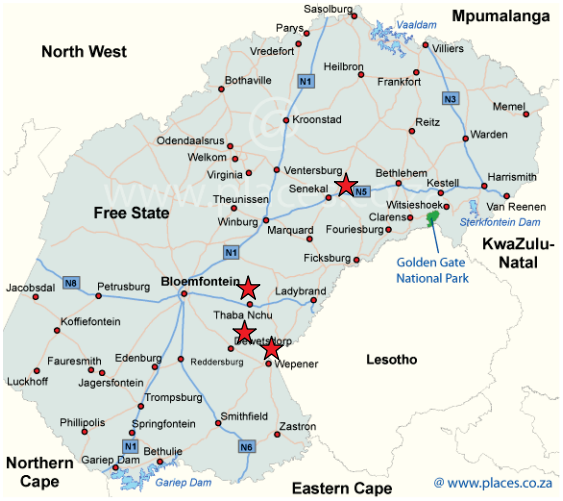

Figure 1. Map of the Free State, showing the farms that were searched during the field excursion.

In total, thirty-four fossils were recovered and include several skulls and postcrania of the Permian dicynodonts *Lystrosaurus maccaigi* and *Daptocephalus leoniceps,* several Early Triassic *Lystrosaurus* skulls and several skulls of relatively rare Middle Triassic taxa provisionally identified as *Diademodon*, *Langbergia* and *Trirachodon*.

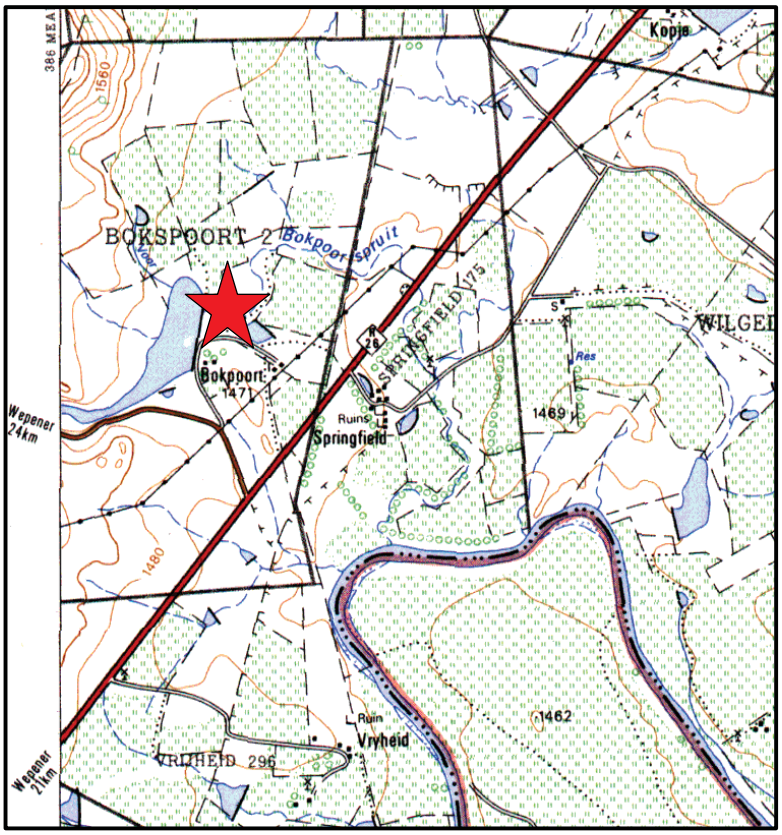

Figure 2. Map of the farm Bokpoort, Wepener District .

Figure 3. The site at Bokpoort, Wepener District.

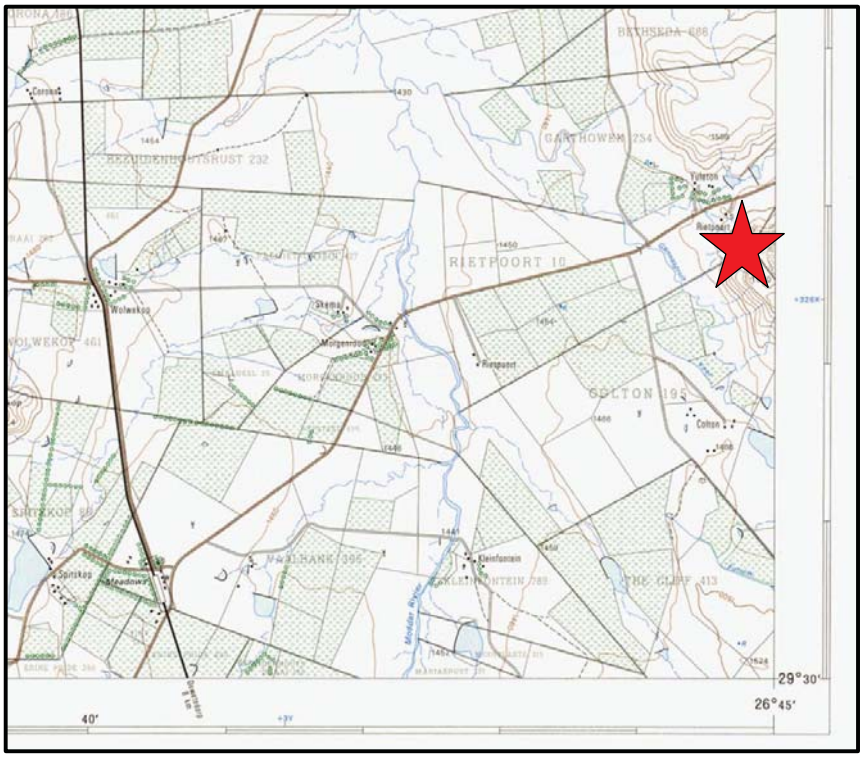

Figure 4. Map of the farm Rietpoort, Dewetsdorp District

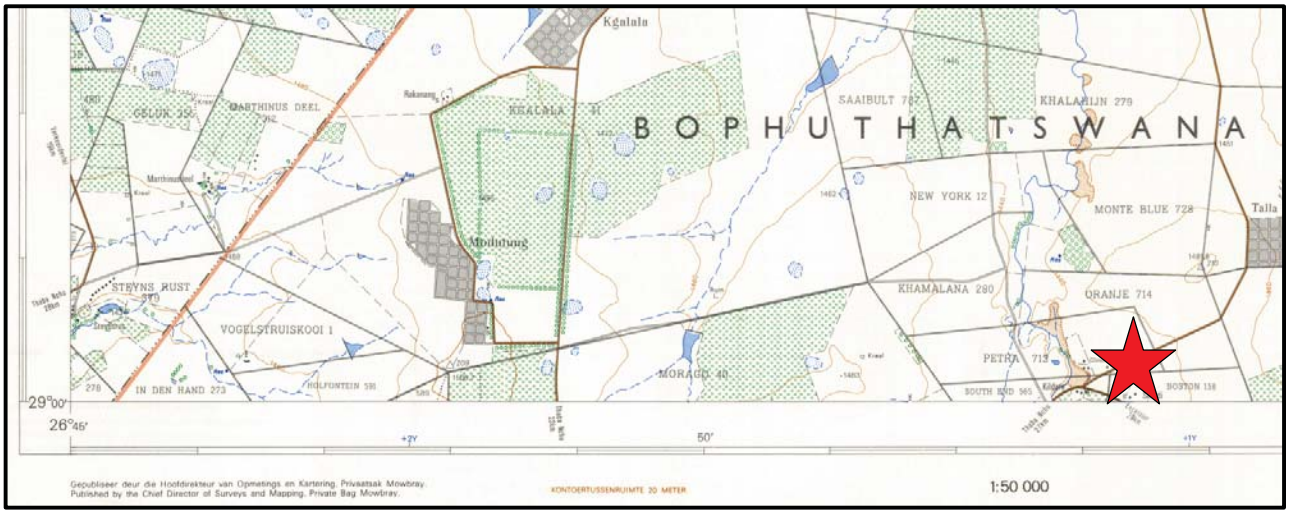

Figure 5. Map of the farm Kildare, Thaba N'Chu District

Figure 6. A *Lystrosaurus maccaigi* skull and postcrania at the site at Kildare.

Figure 7. A therocephalian skull lying on top of a dicynodont skeleton at Kildare.

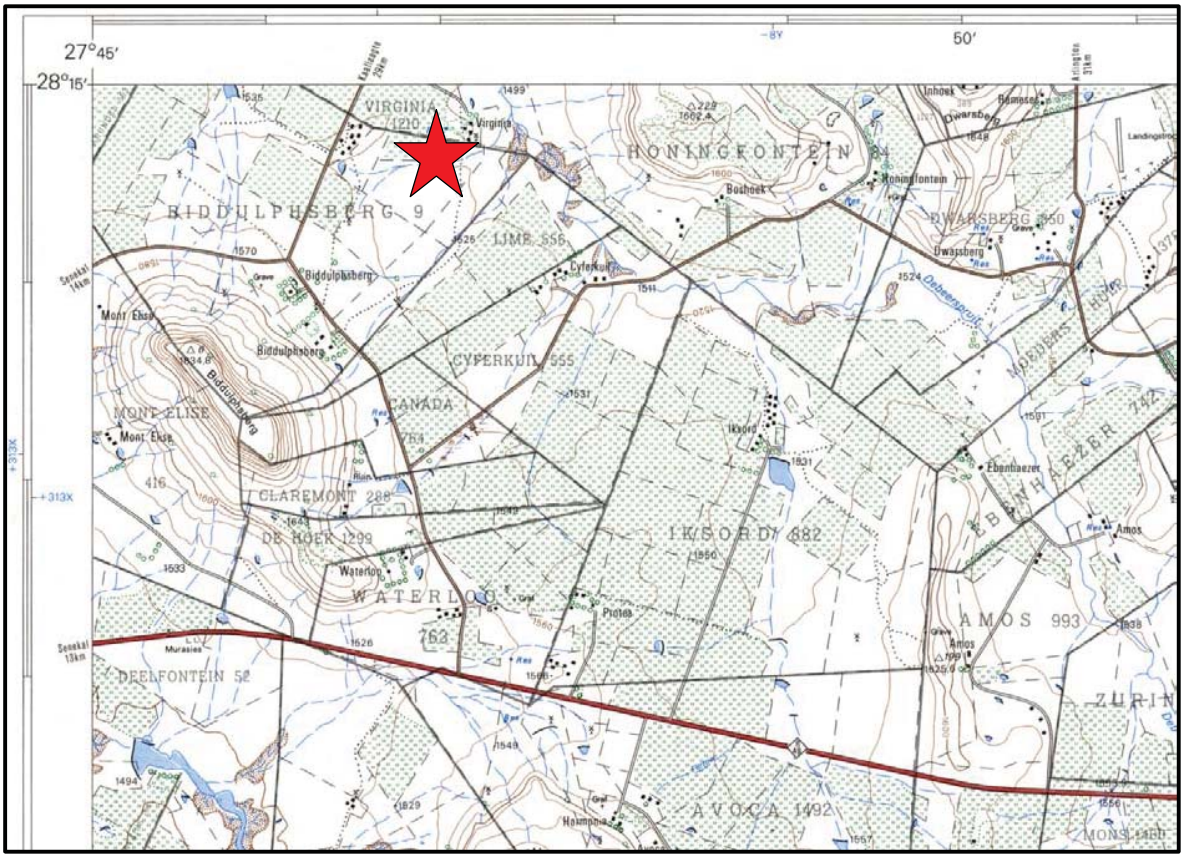

Figure 8. Map of the farm Virginia, Paul Roux District

Figure 9. The site at Virginia, Paul Roux District.

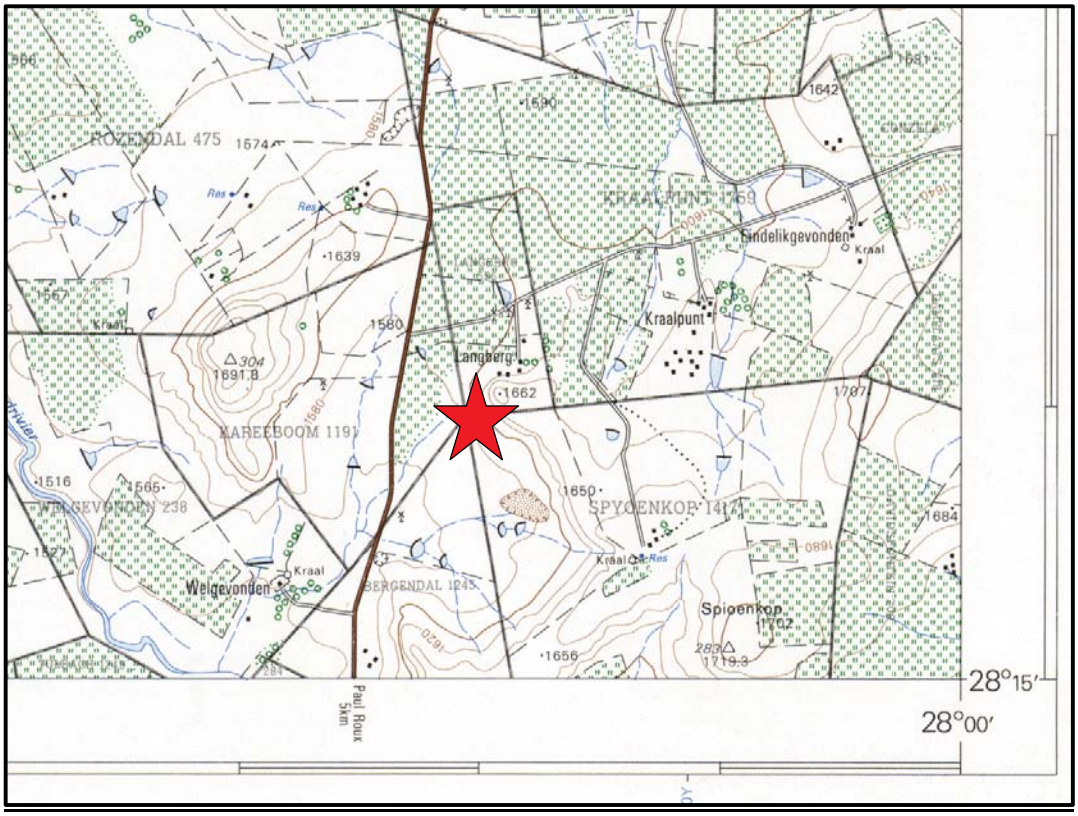

Figure 10. Map of the farm Langberg, Paul Roux District

I was given permission to search all of the above farms, but several land owners gave permission telephonically while we were in the field, thus it was not possible to fax the permission slips to them. However, I have included their phone numbers on all the permission slips and all land owners informed me that SAHRA was welcome to contact them for confirmation.

Future Research

My research will continue to focus on the dynamics of the recovery from the end-Permian mass extinction, with more focus on bone histology during 2013.

Publications 2012

1. Huttenlocker, A. K. and J. Botha-Brink. *in press*. Body size and growth patterns in the therocephalian *Moschorhinus kitchingi* (Therapsida: Eutheriodontia) before and after the end-Permian extinction in South Africa. *Paleobiology*.
2. MacDougall, M. J., S. P. Modesto and J. Botha-Brink. *in press*. The postcranial skeleton of the Early Triassic parareptile *Sauropareion anoplus*, with a discussion of possible life history. *Acta Palaeontologica Polonica.*
3. Botha-Brink, J., A. K. Huttenlocker, and S. P. Modesto. *in press*. Vertebrate Paleontology of Nooitgedacht 68: A *Lystrosaurus maccaigi*-rich Permo-Triassic boundary locality in South Africa *in* C. F. Kammerer, K. D. Angielczyk, and J. Fröbisch (eds.), The Early Evolutionary History of the Synapsida. Springer, Dordrecht, Netherlands.
4. Botha-Brink, J. and R. M. H. Smith. 2012. Palaeobiology of Triassic procolophonids inferred from bone microstructure. *Comptes Rendus Palevol* 11: 419-433.

5. Botha-Brink, J., F. Abdala and A. Chinsamy. 2012. The radiation and osteohistology of non-mammaliaform cynodonts; pp. 223-246 in A. Chinsamy-Turan (ed.), *The forerunners of mammals: radiation, histology and biology*. Indiana University Press, Bloomington, 360 pp.
6. Ray, S., J. Botha-Brink, and A. Chinsamy. 2012. Dicynodont growth dynamics and lifestyle adaptations; pp. 121-146 in A. Chinsamy-Turan (ed.), *The forerunners of mammals: radiation, histology and biology*. Indiana University Press, Bloomington, 360 pp.

Conference Abstracts

1. Botha-Brink, J. and R. M. H. Smith. 2012. Osteohistology of Triassic archosauromorphs from the Karoo Basin of South Africa. 17th Biennial Conference of the Palaeontological Society of Southern Africa, Cape Town, South Africa, 24.
2. Huttenlocker, A., C. Sidor and J. Botha-Brink. 2012. Do body size trends in nonmammalian therapsids reveal the influence of the end-Permian extinction? 17th Biennial Conference of the Palaeontological Society of Southern Africa, Cape Town, South Africa, 38.
3. Smith, R. M. H. and J. Botha-Brink. 2012. Field evidence for stepped mass extinction in the South African Karoo Basin at the end-Permian. 17th Biennial Conference of the Palaeontological Society of Southern Africa, Cape Town, South Africa, 54.

All fossils collected on these field excursions are housed in the Karoo Palaeontology Department's Fossil Collection, at the National Museum in Bloemfontein. They are currently undergoing preparation, but not fossils have yet been completed. If photographs of the fossils are required, I recommend that they be sent when the preparation has been completed, otherwise the fossils will not be identifiable from the photographs.

Please let me know if any further information is required.

Kind Regards

JB-Brink

Jennifer Botha-Brink

Appendix: Accession numbers and co-ordinates for the fossils accessioned into the Karoo Palaeontology Department's Fossil Collection at the National Museum, Bloemfontein. 34 fossils were collected, however, only 29 were identifiable enough to be accessioned. Five fossils were revealed to be merely scrap once they were further examined in the laboratory.

Prefix	Accession number	Farm
NMQR	03965	Rietpoort 2
NMQR	03966	Rietpoort 2
NMQR	03967	Rietpoort 2
NMQR	03968	Bokpoort
NMQR	03969	Andries Pretoruis (BFN) road cutting
NMQR	03970	Kildare
NMQR	03971	Kildare
NMQR	03972	Kildare
NMQR	03973	Kildare
NMQR	03974	Kildare
NMQR	03975	Kildare
NMQR	03976	Kildare
NMQR	03977	Kildare
NMQR	03978	Kildare
NMQR	03979	Kildare
NMQR	03980	Kildare
NMQR	03981	Kildare
NMQR	03982	Roadcutting Thaba Nchu
NMQR	03983	Roadcutting Thaba Nchu
NMQR	03984	Roadcutting Thaba Nchu
NMQR	03985	Langberg
NMQR	03986	Langberg
NMQR	03987	Virginia
NMQR	03988	Virginia
NMQR	03989	Virginia
NMQR	03990	Virginia
NMQR	03991	Virginia
NMQR	03992	Virginia
NMQR	03993	Virginia