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A TAXONOMIC REVISION OF THE GENUS *PROCOLOPHO*N AND THE PHYLOGENETIC RELATIONSHIPS OF PROCOLOPHONOID REPTILES

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A thesis submitted to the Faculty of Science, University of the Witwatersrand, in fulfilment of the requirements for the degree of Doctor of Philosophy

Johannesburg, 2006

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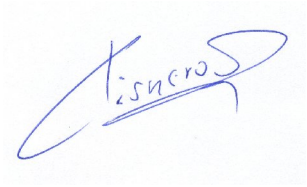
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I declare that this thesis is my own work. It is being submitted for the Degree of Doctor of Philosophy in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other university.

I state that the papers contained in this thesis are my own, unaided work, except for the paper “A procolophonoid reptile with temporal fenestration from the Middle Triassic of Brazil”, written in collaboration. In this work, I contributed to the anatomical description and discussion, and undertook all the illustrations of the taxon.



24th of April 2007

ABSTRACT

This study presents a taxonomic revision of some procolophonoid parareptiles and a detailed, global analysis of procolophonid intrarelationships. The poorly known genus *Candelaria*, from the Middle Triassic of Brazil, is identified on the basis of new material as an owenettid, rather than a procolophonid as previously thought. Thus, *Candelaria* represents the youngest owenettid and the first member of this group from South America. The cranium of *Candelaria* is also remarkable for having temporal fenestrae, and the significance of this character within the Parareptilia is discussed. Based on a comprehensive review of specimens referred to different *Procolophon* species, it is proposed that only the type species, *Procolophon trigoniceps*, is valid. Thus, *Procolophon* specimens from Brazil, South Africa, and Antarctica are all referable to *P. trigoniceps*. Consequently, *P. trigoniceps* has one of the broadest known geographic ranges among Triassic tetrapod species.

A comprehensive cladistic analysis of procolophonids more firmly resolves the relationships within that group. The analysis reveals that Procolophoninae and Leptopleuroninae are valid monophyletic groups, whereas Spondylolestinae is paraphyletic. The species formerly assigned to the genus '*Thelegnathus*' from the Middle Triassic of South Africa, and those assigned to '*Eumetabolodon*' from the Lower-Middle Triassic of China, are paraphyletic.

The poorly known *Spondylolestes* from the *Dicynodon* Assemblage Zone of South Africa is considered valid and possibly represents the only Permian procolophonid in Gondwana. A new species, *Kitchingnathus untabeni*, is identified in the *Lystrosaurus* Assemblage Zone of South Africa. It is a basal member of the Procolophonidae and co-occurs with *Procolophon* in the Upper Katberg Formation. The new taxon is characterized by the presence of a large number of thin, bicuspid teeth. Character optimisation indicates that bicuspid teeth were acquired independently in *K. untabeni*, and hence originated twice during

procolophonid evolution. A review of procolophonid records worldwide reveals a fossil hiatus for members of this group in the Ladinian and most of the Carnian.

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LIST OF PAPERS SUBMITTED AS PART OF THIS THESIS

This thesis is presented in the format of a compilation of four papers which were published/submitted by the author while registered for a PhD degree.

Cisneros, J.C., Damiani, R., Schultz, C. Rosa, A. da, Schwanke, C., Neto, L.W. and Aurélio, P.L.P. (2004) A procolophonoid reptile with temporal fenestration from the Middle Triassic of Brazil. *Proceedings of the Royal Society of London, Series B, Biological Sciences*, vol. 271, pp. 1541-1546.

Cisneros, J.C. Taxonomic status of the Triassic reptile *Procolophon* in Gondwana. *Palaeontologia africana* (in press)

Cisneros, J.C. Phylogenetic relationships of procolophonid parareptiles. *Journal of Systematic Palaeontology* (submitted)

Cisneros, J.C. A basal procolophonid reptile from the Lower Triassic of South Africa. *Palaeontology* (submitted)

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