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Kitching, James W.; Raath, Michael A.

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FOSSILS FROM THE ELLIOT AND CLARENS FORMATIONS (KAROO SEQUENCE) OF THE NORTHEASTERN CAPE, ORANGE FREE STATE AND LESOTHO, AND A SUGGESTED BIOZONATION BASED ON TETRAPODS

by

J.W. Kitching and M.A. Raath

Bernard Price Institute for Palaeontological Research, University of the Witwatersrand, Johannesburg

ABSTRACT

Recent intensive collecting from the Elliot Formation and lower part of the Clarens Formation of the Orange Free State is reported and a broad description is given of the general lithology of the beds in this area.

Productive localities in the main Karoo basin (northeastern Cape Province, Lesotho, Orange Free State) are listed with a summary of the tetrapods recovered from each.

A preliminary biozonation of these strata is proposed based on the vertical ranges of the prosauropod saurischian genera *Euskelosaurus* and *Massospondylus*. Attention is drawn to a palaeontologically rich horizon within the *Massospondylus* Range Zone which is designated the *Tritylodon* Acme-zone on the basis of the abundance in it of the advanced cynodont *Tritylodon* cf. *longaevus*.

It is concluded that previous taxonomic work on the tetrapod fauna of these strata has resulted in an erroneous impression of faunal diversity.

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INTRODUCTION

More than half a century after the publication of Haughton's (1924) monographic study of the fauna and stratigraphy of the "Stormberg Series", no single publication has yet emerged to supplant it as the standard and most widely used reference for that important part of the Karoo Sequence. Subsequent studies have added greater stratigraphic, lithological, sedimentological and palaeontological detail to Haughton's observations and have necesitated modification of parts of his pioneering synthesis, but his study nevertheless retains its overall validity. This in itself pays considerable tribute to the accuracy and thoroughness of the work of Dr. S.H. Haughton, whose memory is honoured in this collection of papers.

The purpose of this contribution is to summarize previous work in historically productive localities of the Elliot Formation ("Red Beds") and Clarens Formation ("Cave Sandstone") in the northeastern Cape Province and adjacent territory in Lesotho (Table 1, 2), and to give a preliminary account of recent intensive collecting trips to exposures of these strata in the northeastern and eastern Orange Free State (fig. 1, Table 3) by members of staff of the Bernard Price Institute for Palaeontological Research. The first of these trips (October–November 1978) concentrated on exposures in the Bethlehem and Fouriesburg districts, particularly in the Bramleyshoek area, the Golden Gate Highlands National Park and in the vicinity of the villages of Clarens and Fouriesburg; the second (January–March 1980) investigated exposures in parts of the Marquard and Clocolan districts; the third (January–February 1981) re-examined some very productive exposures in the Clocolan district and collecting extended to good exposures in the Ladybrand district; and the fourth expedition (October–November 1982) concentrated mainly on exposures in the vicinity of Ladybrand and around the Modderpoort Mission station.

Observations in the field have highlighted a number of stratigraphic and lithological features that provide useful pointers to the more productive fossil-bearing beds, at least in those areas we

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have examined in the northeastern and eastern Orange Free State. It is planned to extend these studies to other parts of the country where the Elliot Formation and Clarens Formation are exposed, particularly in the Herschel, Lady Grey, Barkly East, Maclear and Mount Fletcher districts of the Cape Province and Transkei (fig. 1), to test the lateral and vertical extent of the preliminary biozonation proposed here (fig. 2).

Although good progress has been made with the preparation of the fossil material recovered during these field expeditions, our identifications are as yet only preliminary and tentative. A number of new taxa are certainly present. Detailed accounts of the fossils recovered will be prepared for publication in due course.

LITHOSTRATIGRAPHY AND FOSSIL VERTEBRATE DISTRIBUTION

The sedimentary rocks of the "Stormberg Series" in South Africa and Lesotho were originally divided by Dunn (1878) on the basis of their lithology into the Molteno, Red Beds and Cave Sandstone stages, now termed the Molteno Formation, Elliot Formation and Clarens Formation respectively (see e.g. SACS 1980 : 539–540). Dunn's divisions were later elaborated by Du Toit (1904–1929). Incor-

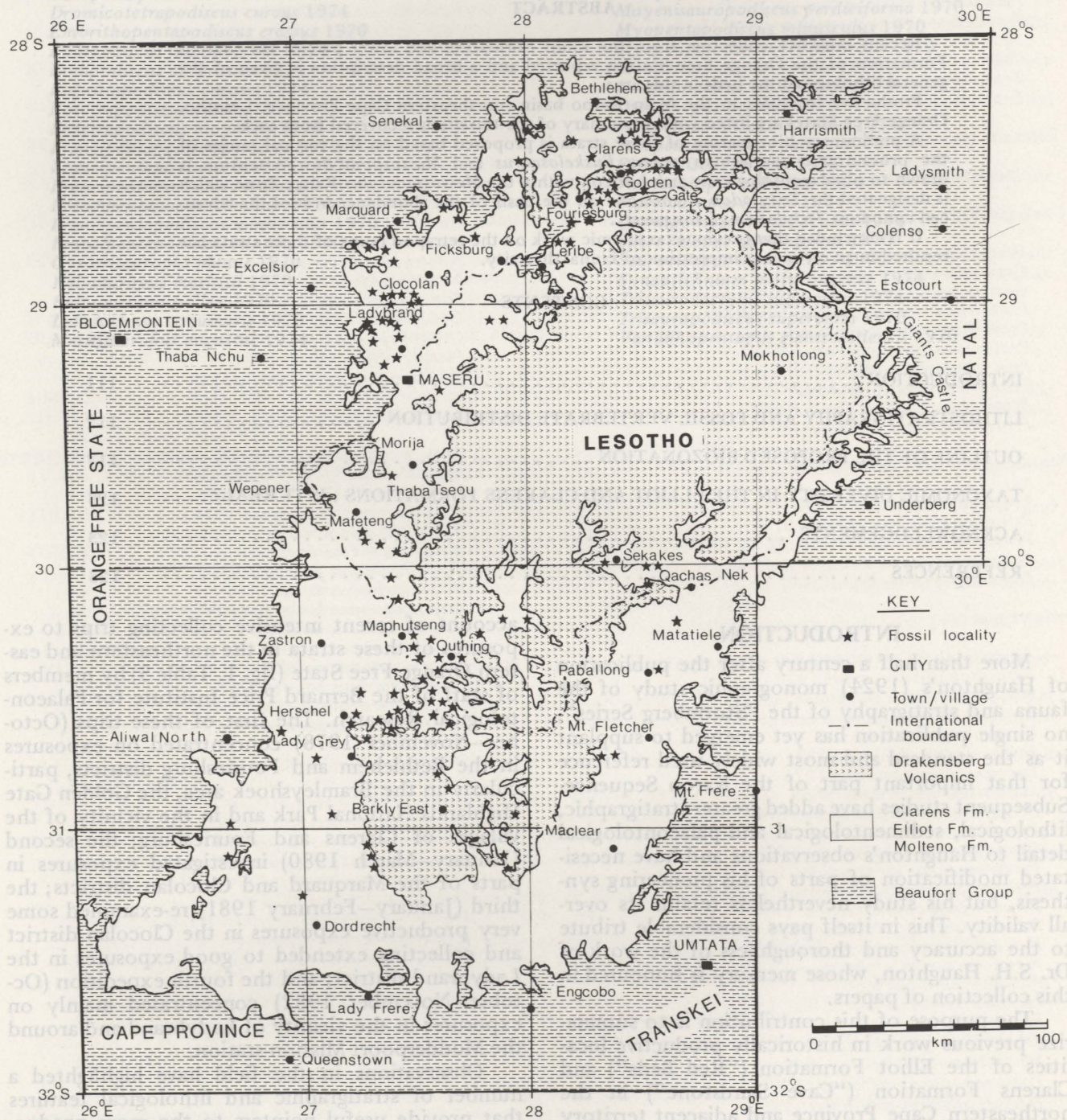


Figure 1 Tetrapod fossil localities in the Elliot and Clarens Formations of the main Karoo Basin (South Africa and Lesotho).

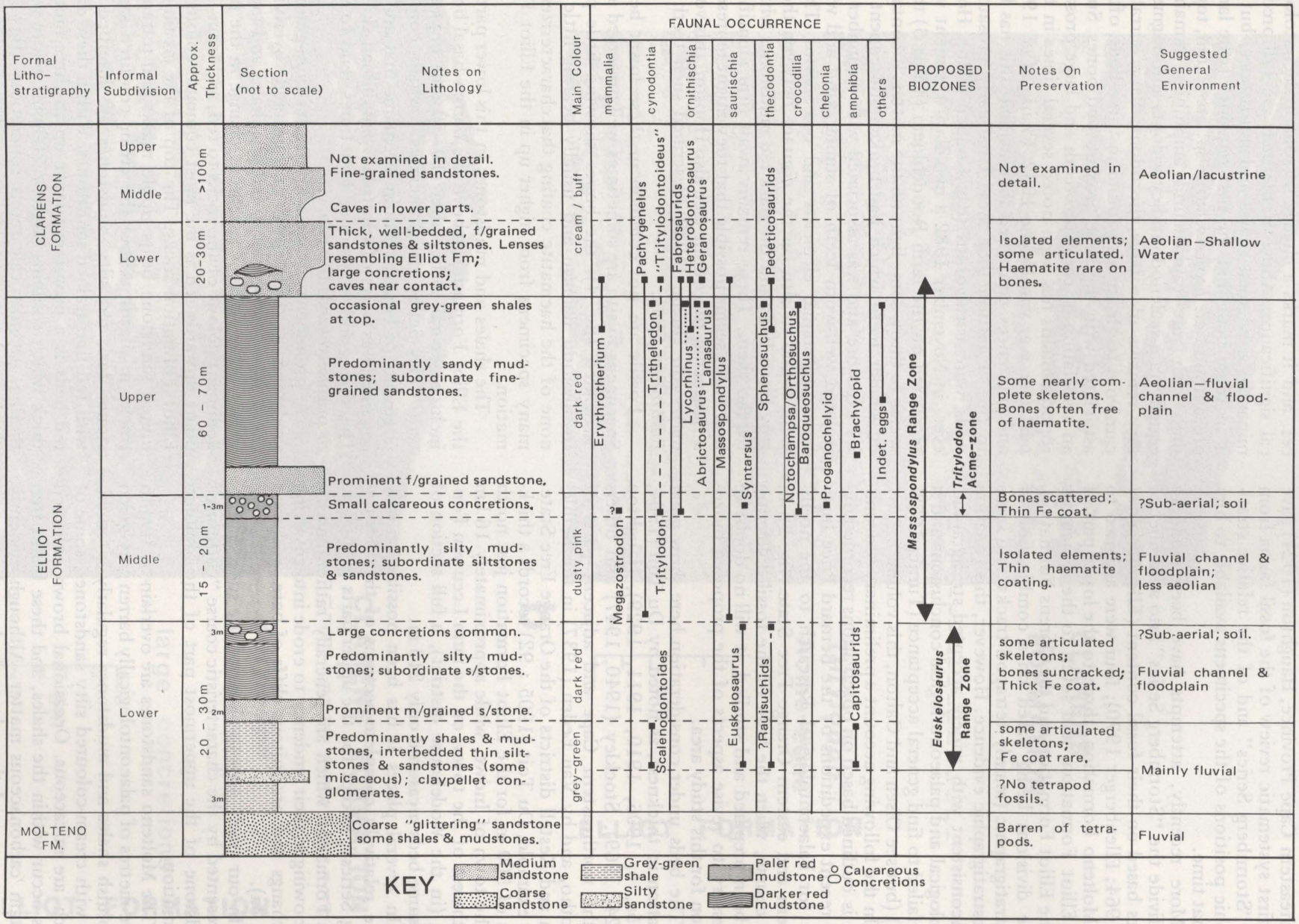


Figure 2 Summary of lithostratigraphy and biostratigraphy – Elliot and Clarens Formations, eastern Orange Free State – based on collections and field notes in the Bernard Price Institute for Palaeontological Research.

porating the results of his three expeditions to the Elliot Formation and Clarens Formation in the northeastern Cape Province, Haughton (1924) gave the first systematic review of the fossil fauna from the "Stormberg Series" and of the relative stratigraphic positions of the specimens available to him at that time.

More recently, attempts have been made to subdivide the "Stormberg Series" into a number of zones based on their fossil content (Ellenberger *et al.* 1964; Ellenberger 1970); four were assigned to the Molteno Formation, three to the lower part of the Elliot Formation, and seven to the remainder of the Elliot Formation and the Clarens Formation, these divisions being based on a combination of biostratigraphic (mainly tetrapod tracks) and some lithostratigraphic evidence. However, this zonation is inconsistent with widely accepted stratigraphic, lithological and palaeontological conclusions and it has failed to find general acceptance (Turner 1972: 351) (but see Olsen and Galton, this volume).

In the following account a preliminary biozonation is outlined based on observations recorded during recent expeditions by the Bernard Price Institute for Palaeontological Research to the northeastern and eastern Orange Free State (fig. 2). In due course, when the bulk of the fossil collection has been prepared and studied, it will no doubt be necessary to revise aspects of the proposed biozonation for this study area.

The beds under consideration here show great variation in thickness, as noted by Du Toit (1904, 1905a, b, 1906, 1910, 1911, 1929), Haughton (1924, 1969), Stockley (1940, 1947) and others in the northeastern Cape and adjacent parts of Lesotho, and by Van Eeden (1937) in the Bethlehem and Kestell districts of the Orange Free State. For example, Du Toit (1905 : 92) records a thickness of 500 m for the Elliot Formation just north of the town of Indwe, while approximately 16 km northwest of the town, on the farm Leeuwen Fontein (in the Wodehouse district), a full section of the same beds measured only 213 m.

In several places it has been possible to examine relatively complete sections of the "Stormberg Series", except for the upper parts of the Clarens Formation which are generally rather inaccessible owing to their tendency to erode into towering overhangs and precipitous cliffs of bare sandstone (fig. 3a).

In our study area the base of the succession is represented by the characteristic coarse "glittering" sandstone of the uppermost part of the Molteno Formation.

The Molteno sandstones are overlain by two to three metres of palaeontologically barren grey-green to bluish shales and mudstones regularly interbedded with cream-coloured silty sandstones, some of which are micaceous. Occasional brown coloured beds occur within the shales, and these beds often contain carbonaceous matter. Although evidently barren, we regard these lower beds as the base of the Elliot Formation since they are not visibly distinct from the succeeding argillaceous beds, which are fossiliferous. An impersistent medium grained sandstone overlies these basal beds at several places, and it marks a change of some palaeontological significance. Above it the beds are still predominantly grey-green shales and mudstones, but it is in these beds that the first remains of the large prosauropod cf. *Euskelosaurus* sp. are found, together with rare capitosaurid amphibian remains, equally rare scalenodontid cynodonts and fragmentary remains of a large thecodont. Large serrated carnivore teeth are also found in these beds, often associated with the large prosauropod bones. Such an association of carnivore teeth and large prosauropod remains has been noted several times in the past (see e.g. von Huene 1932, Charig *et al.* 1965 and references contained therein) and this has led to the suggestion that these large early prosauropods were carnivorous (e.g. Cooper 1980). However, in November 1982 a maxillary fragment was recovered on the farm Roodebloem (Table 3) that seems to throw some light on the matter; it contained similar teeth which had broken subsequent to its exposure and was associated with a number of isolated well-worn teeth of similar kind and with large postcranial elements and osteoderms. They were found in situ on the contact between these grey-green beds and the dark red mudstones which overlie them. These remains await firm identification but it seems possible that they might represent a rauisuchid thecodont (see also Hopson, this volume). Von Huene (1932) described such teeth as *Basutodon ferox*.

Fossils are not common in these lower beds. Specimens in situ are sometimes well preserved and associated (fig. 4), the bones showing little prefossilization damage and usually bearing little or none of the haematite coating that characterizes so many specimens from higher up in the Elliot Formation.

The shales and mudstones in this lower part of the Elliot Formation, above the barren basal beds, include several rather thin (10–50 cm) impersistent "clay-pellet conglomerates" which contain fragments of bones, teeth and remains that are recognisable as parts of capitosaur amphibian skulls. The shales and mudstones sometimes tend to red or purple towards the top.

A prominent cream-coloured medium-grained sandstone is frequently encountered overlying these upper grey-green to reddish shales and mudstones. Above this is an abrupt change in the predominant colour of the rocks to red, and from this point upwards red is the most common colour of Elliot Formation rocks. The top of the cream-coloured sandstone bears ripple marks and tetrapod tracks in places. Above the cream-coloured sandstone, dark red silty mudstones are interbedded with red fine-grained sandstones. Within these dark red beds is a prominent layer up to three metres thick which contains large (> 200mm), white-weathering, irregular calcareous concretions (fig. 3b). This layer has been traced from where it was first noted in the vicinity of the village of Clarens (on the farms Bramleyshoek and Noupoortsnek) to





Figure 3 a) Exposures on the farm Bramleyshoek, Bethlehem district.
b) Exposures on the farm Vroolykheid, Ladybrand district (large calcareous concretions arrowed).



Figure 4 Disarticulated, associated skeleton of a large prosauropod dinosaur, cf. *Euskelosaurus* sp., from the lower part of the Elliot Formation on the farm Edelweiss, Ladybrand district.

localities in the vicinity of Ladybrand – a distance of about 150 km. The concretionary horizon seems to mark the upper limit of the vertical range of the large prosauropods, cf. *Euskelosaurus* sp.

As is generally true of the lower horizons, fossil remains occur sparsely throughout these red sediments. Isolated skeletal elements, articulated partial skeletons, and disarticulated skeletons with the elements still closely associated, have been recovered. The bones are normally badly "sun-cracked", distorted and covered by a hard, relatively thick ($\sim$ 10 mm) coating of haematite. The specimens from the concretionary horizon are especially badly affected, not only by the haematite layer but also by nodular calcareous growths, particularly on the articular ends of the long bones, making them very difficult to prepare. Lithologically this horizon may reflect a major period of sub-aerial exposure resulting in calcareous soil development (caliche).

Above the concretionary layer the colour of the rocks again changes, to a "dusty" brownish-pink. Silty mudstones are the dominant rock type interbedded with occasional thin sandstones, some cream-coloured and others a "dusty-pink" similar to the mudstones. This succession is in turn overlain by a bed one to three metres thick of rather sandy mudstone with light grey-green patches in places and an abundance of small (< 60 mm) calcareous concretions. We propose to designate this concretion-rich layer the *Tritylodon* Acme-zone (fig. 2) because of the abundance in it of the readily recognizable cynodont therapsid *Tritylodon* sp. (cf. *T. longaevus*). The *Tritylodon* Acme-zone occurs at the top of what we regard as the middle part of the Elliot Formation, and it is comparatively rich in tetrapod fossils in terms of both diversity and abundance. It has been traced from the vicinity of Clarens village, where it was first noted by J.W. Kitching on the farms Bramleyshoek and Boshoek in 1978, to localities in the Ladybrand district (fig. 1). To date over 100 specimens of *Tritylodon* have been recovered, including postcranial elements and skulls varying widely in size and in degree of preservation. Most of the more or less complete skulls found in situ were lying on their side. This is noteworthy because such a position does not seem to represent a likely stable resting position for a detached isolated skull, bearing in mind the broadly flared zygoma of the *Tritylodon* skull.

The dusty-pink rocks of the middle part of the Elliot Formation have yielded a considerable number of small to medium-sized prosauropod dinosaurs, cf. *Massospondylus* sp. They make their first appearance in the lowermost beds of the dusty-pink succession together with the first representatives of the advanced tritheledontid cynodont *Pachygenelus* sp. These two genera are present in the *Tritylodon* Acme-zone together with *Tritylodon* itself, fabrosaurid ornithischian dinosaurs, and protosuchians; the zone has also yielded fragmentary remains of the theropod dinosaur *Syntarsus* and a skull and partial carapace of a new proganochelyid chelonian.

Most of the fossil material recovered from these beds in the middle part of the Elliot Formation is coated with a thin (ca. 1–5mm) layer of haema-

tite, but in a few instances specimens occur free of haematite in the normal red sediments and occasionally also in a grey-green haematite-free matrix.

At some localities the base of what we consider the upper part of the Elliot Formation is marked by a prominent cream to buff-coloured, medium-grained sandstone which coincides with the top of the *Tritylodon* Acme-zone; elsewhere the transition is gradational from dusty-pink to dark red sandy mudstones, interbedded with laterally impersistent, buff, fine-grained sandstones.

At three adjacent localities in the Ladybrand district, on the farms Diepgesicht, Vastrap and Broken Slopes, a grey-green shale and mudstone horizon approximately two metres thick overlies the prominent sandstone mentioned above. It contains characteristically flattened calcareous concretions with veinworks containing an analcite infill, and it has yielded articulated skeletal remains and tooth plates of lungfish, articulated cranial and postcranial remains of large brachyopid amphibians, and an abundance of conchostracans. This horizon may be indicative of a local shallow playa lake.

Isolated skeletal elements, especially of *Massospondylus* sp., occur throughout the upper division of the Elliot Formation. Well preserved articulated partial skeletons have been recovered, the bones being either haematite-free or having only a thin haematite coating, and some of the better preserved fossil specimens have come from here. Fossils are, however, by no means abundant in these upper beds.

In some places at the top of the Elliot Formation grey-green, red and purple shales locally overlie the red mudstones and they are interbedded with fine-grained siltstones and sandstones. They have been referred to by some authors as "Transitional Beds" (Van Eeden 1937, Ellenberger *et al.* 1964, Ellenberger 1970).

In comparatively few places was it possible to examine the lower part of the Clarens Formation because of the steeply eroded slopes and vertical sandstone cliffs. The contact between the Elliot Formation and Clarens Formation is abrupt in some places, possibly indicating the presence of erosion surfaces. The lower part of the Clarens Formation is generally represented by thick, well-bedded fine-grained sandstones which are often light pink to red. Very hard oblong and spheroidal calcareous concretions of varying size are not uncommon here. Lenticular bodies which lithologically resemble the dark red beds of the uppermost parts of the Elliot Formation have been noted at places within the lower sandstones of the Clarens Formation.

While examining exposures in the Bethlehem, Fouriesburg, Marquard and Ladybrand districts, the opportunity was taken to revisit previously recorded fossil localities such as Noupoortsnek, Foutanie, St. Fort, Magetzane and the Ladybrand townlands, all of them being type localities of fossil vertebrate taxa except for St. Fort.

On the farm Foutanie it was established that the holotypes of *Massospondylus harriesi, Aetonyx palustris* and *Gryponyx africanus* could only have been recovered from fairly good exposures of the upper part of the Elliot Formation and not from the Clarens Formation as stated by Anderson and Anderson (1970 : Chart 2). The contact between the two formations is rather abrupt, the softer sediments of the Elliot Formation having eroded away in such a manner that extensive overhangs have formed on the contact making the Clarens Formation sediments practically inaccessible. The middle parts of the Elliot Formation are in most places on this farm obscured by plant growth and scree from the overlying beds leaving only the upper parts of the Elliot Formation readily accessible to collectors.

The farm Megatzane, type locality of *Tritylodontoideus maximus* Fourie 1962 (= *Tritylodon longaevus*, see Hopson and Kitching 1972), is situated on the western side of Vegkop, an isolated mountain in the Marquard district. The Elliot Formation is much attenuated here and exposures are rather sparse on the slopes of the mountain, which is capped by approximately 20 m of vertical sandstone cliffs of the Clarens Formation. With the kind assistance of Mr. H.J. de Kock of the adjacent farm Môreson, it was easy to locate the sandstone block from which the holotype of "*Tritylodontoideus*" (a weathered natural mould of an articulated, large partial skeleton and badly distorted skull) was removed in July 1941 by the late Dr. E.C.N. van Hoepen, at that time Director of the National Museum, Bloemfontein. From the texture and visible characteristics of the sandstone, the shape of the fallen block from which the specimen of "*Tritylodontoideus*" was originally removed, and a careful scrutiny of the cliff face, it was possible to establish beyond reasonable doubt that the block had tumbled from its original position at the base of the Clarens Formation, immediately above the contact with the upper beds of the Elliot Formation.

OUTLINE OF THE PROPOSED BIOZONATION

The biozonation proposed here for the Elliot Formation and basal Clarens Formation can be resolved into the vertical ranges of the two most abundant prosauropod dinosaurian taxa (fig. 2) the genus *Euskelosaurus* in the lower parts of the Elliot Formation and the genus *Massospondylus* higher in the Elliot Formation and reaching just into the base of the Clarens Formation. These two zones broadly correspond to Cooper's (1982) *Plateosaurus* Zone and *Massospondylus* Zone respectively. However, Cooper (1982: 92) states that his *Plateosaurus* Zone "may be characterized by the appearance of tritylodontid and tritheledontid cynodonts and protosuchian crocodiles . . . . .". In our study area this characterization does not hold; the tritylodontids, tritheledontids and protosuchians are found only in the overlying *Massospondylus* Range Zone and have not so far been found in the *Euskelosaurus* Range Zone (fig. 2).

The notion of a "*Massospondylus* Zone" is by no means new; as far back as 1965, Bond noted

TABLE 1 "STORMBERG" TETRAPOD FOSSIL LOCALITIES – SOUTH AFRICA – COLLECTIONS OTHER THAN BPI

MAGISTERIAL DISTRICT	LOCALITY NAME (Numbers are farm identification numbers) * Denotes TYPE LOCALITY	1:50 000 MAP SHEET AND TITLE	LOCALITY CO-ORDINATES	STRATIGRAPHY AND FOSSILS RECORDED U = upper; M = middle; L = lower (Synonymy not considered – see text) *Denotes TYPE SPECIMEN	REFERENCE OR SOURCE *Denotes TYPE DESCRIPTION
BETHLEHEM	– *Noupoortsnek (Naauwpoorts Nek) (578)	2828AD JORDAANRIVIER	28°29′S 28°25′E	Elliot Fm. : *Tritylodon longaevus, *Dromicosaurus gracilis, Erythrochampsa longipes (Horizons not specified)	*Van Hoepen 1920(b); Haughton 1924; Broili and Schröder 1936.
HARRISMITH	– *Beauchef Abbey (215) (Not "Beaucherf", see Owen 1854)	2829AC HARRISMITH	28°31′S 29°10′E	Elliot Fm. (U) : *Massospondylus carinatus (Horizon not specified but J.W.K. has confirmed that only upper part of Elliot Fm. is accessible)	*Owen 1854; Von Huene 1932
FOURIESBURG	"Slabberts" (rail siding, no precise locality)	2828AC SLABBERTS	? ?	Elliot Fm. : Basutodon ferox (Horizon not specified)	Von Huene 1932
	*Sonderhout (291)	2828AC SLABBERTS	(?)28°30′S 28°14′E	Elliot Fm. : *Eucnemesaurus fortis (Horizon not specified)	*van Hoepen 1920(b)
	St Fort [Letsoana Stad 347]	2828CB CLARENS	28°33′S 28°25′E	Elliot Fm. (U) : Massospondylus browni	van Hoepen 1920(a); Haughton 1924
	Caledon Park [part of Dunblane 335]	2828CB CLARENS	28°33′S 28°23′E	Elliot Fm. : Tritylodon sp., amphibian remains (Horizons not specified)	S A M Catalogue
	*Fouriesburg [on Glen Skye 121]	2828CA FOURIESBURG	(?)28°37′S 28°14′E	Elliot Fm. (U) : *Gryponyx taylori	*Haughton 1924
	*Foutanie (331)	2828CB CLARENS	28°40′S 28°15′E	Elliot Fm. (U) : *Massospondylus harriesi, *Aetonyx palustris, *Gryponyx africanus, Thecodontosaurus skirtopodus	*Broom 1911; Haughton 1924
FICKSBURG	– *"Near Rosendal" (no precise locality)	2827DB ROSENDAL	(?)28°30′S 27°57′E	Clarens Fm. : *Aristosaurus erectus, Thecodontosaurus dubius, *Pedeticosaurus leviseuri (Horizons not specified)	*Van Hoepen 1915, *1920(a); Haughton 1924
MARQUARD	– *Magetzane (292)	2827CC EXCELSIOR	28°47′S 27°14′E	Clarens Fm.(L) : *Tritylodontoideus (sic) maximus (Later spelt Tritylodontoides)	*Fourie 1962, 1963
LADYBRAND	– Ladybrand Townlands	2927AB LADYBRAND	29°12′S 27°26′E	Clarens Fm. : *Thecodontosaurus dubius, Thecodontosaurus minor, *Gyposaurus capensis (Horizon not specified)	*Broom 1911; *Haughton 1924
				Clarens Fm.(L) : *Diarthrognathus broomi	*Crompton 1958
LADY GREY	"Lady Grey" (no precise locality)	(?)3027CA LADY GREY	30°42′S 27°13′E	Elliot Fm. : Melanorosaurus sp. (Horizon not specified)	S A M Catalogue
	Waaihoek	(?)3027CA LADY GREY	30°43′S 27°13′E	Elliot Fm. (L) : Euskelosaurus sp.	S A M Catalogue
	Welgedacht	(?)3027CA LADY GREY	30°44′S 27°11′E	Elliot Fm. (L) : "?Plateosaurus sp."	S A M Catalogue
	Brakfontein (Braakfontein)	(?)3027CA LADY GREY	30°45′S 27°06′E	Elliot Fm. (L) : Euskelosaurus browni	S A M Catalogue
ALIWAL NORTH	*"District of Aliwal North" (no precise locality)	(?)3026DB BOSBERG	? ?	Elliot Fm. : ?*Orinosaurus (= Euskelosaurus) capensis (Horizon not specified)	*Lydekker 1889; von Huene 1906
	*"Kraai River" (no precise locality)	(?)3027DB/3027CD	Fide Haughton (1924: 424)"..almost certainly from the Kraai River". But see Barnards Spruit below.	Elliot Fm. (L) : *Euskelosaurus browni (see below)	*Huxley 1866; Haughton 1924
BARKLY EAST	*Funnystone	3027DB BEN MACDHUI	(?)30°43′S 27°48′E	Clarens Fm.(L) : *Notochampsa istedana	*Broom 1904
	*Eagles Crag	3027DC BARKLY EAST	(?)30°50′S 27°45′E	Elliot Fm. (U) : *Erythrochampsa longipes	*Broom 1904; Haughton 1924
	*Barkly East	3027DC BARKLY EAST	(?)30°50′S 27°45′E	Clarens Fm. : *Hortalotarsus skirtopodus (Horizon not specified)	*Seeley 1894(b)
ALBERT (BURGERSDORP)	*Barnards Spruit [Ezelsklip]	(?)3026DC KRAMBERG	(?)30°57′S 26°37′E Fide Seeley (1894), but see Kraai River above	Elliot Fm. (L) : *Euskelosaurus browni (see above)	*Huxley 1866; Seeley 1894(a)
	*Witkop (Jamestown)	(?)3126BA/BB JAMESTOWN	(?)31°05′S 26°47′E	ElliotFm. (L) : *Plateosaurus stormbergensis	*Broom 1915
	*Witkop (Albert)	3126BA WITKOP	(?)31°08′S 26°39′E	Elliot Fm. (U) : *Pachygenelus monus	*Watson 1913
WODEHOUSE	– *Milner [part of Swempoort]	3126BB JAMESTOWN	(?)31°14′S 27°00′E	Elliot Fm. (L) : *Roccosaurus tetrasacralis (nom.nud.)	(*Van Heerden, unpublished MS)
ELLIOT	– *Barkly Pass [on Farm Tulloch]	3127BB BARKLY PASS	(?)31°27′S 27°51′E	Clarens Fm.(L) : *Geranosaurus atavus	*Broom 1911
MACLEAR	– *Pitsing	(?)3028CB/3028CD	? ?	Elliot Fm. : *Thecodontosaurus minor (Horizon not specified)	*Haughton 1918
TRANSKEI (MATATIELE)	– *Makomoreng	(?)3028BA	(?)30°11′S 28°37′E	Elliot Fm. : *Massospondylus schwarzi (Horizon not specified)	*Haughton 1924
TRANSKEI (MT.FLETCHER)	– *Paballong	3028BC SIGOGA	(?)30°26′S 28°31′E	Elliot Fm. (U) : *Trithelodon riconoi, *Lycorhinus angustidens, *Sphenosuchus acutus, Abrictosaurus consors (*Lycorhinus consors)	*Broom 1912(a); Haughton *1915 *1924; Thulborn 1970, (*)1974; Hopson 1975; Gow 1975
	*Kromme Spruit & mountain (Kromspruit)(no precise locality)	3027CB STERKSPRUIT	? ?	Elliot Fm. (U) : Heterodontosaurus tucki	Santa Luca et al. 1976
				Elliot Fm. (L) : "Ornithischian", Massospondylus sp., "Aetosaurus" (sic)	S A M Catalogue
				Elliot Fm. (L) : *Plateosaurus cullingworthi, *Euskelesaurus (sic) africanus	*Haughton 1924
	*"Telle River" (no precise locality)	3027DA BLIKANA	? ?	Elliot Fm.(M-U): *Massospondylus(?)browni [= Thecodontosaurus browni von Huene 1906 (pars) and Thecodontosaurus skirtopodus (pars)], Massospondylus sp.	Seeley 1895(a); S A M Catalogue
				Elliot Fm. (L) : Euskelosaurus sp.	S A M Catalogue
	Telle Drift	3027BC PALMIETFONTEIN	30°26′S 27°34′E	Elliot Fm. (L) : Euskelosaurus sp.	S A M Catalogue
	St Michaels Mission	3027AD DULCIE'S NEK	30°28′S 27°26′E	Elliot Fm. : Pachygenelus sp., Tritylodon sp., Fabrosaurus sp., Massospondylus sp., "large prosauropod" (Horizons not specified)	S A M Catalogue
	Musong Valley	3027BC PALMIETFONTEIN	30°30′S 27°33′E	Elliot Fm. (U) : Crocodilian remains, "ornithischian"	S A M Catalogue
	Kwa Nojiki	3027CB STERKSPRUIT	30°31′S 27°28′E	Elliot Fm. : Euskelosaurus sp. (Horizon not specified)	von Huene 1932
TRANSKEI (HERSCHEL)	*Tyinindini	3027DA BLIKANA	(?)30°32′S 27°32′E	Clarens Fm.(L) : *Heterodontosaurus tucki	*Crompton & Charig 1962
				Elliot Fm. : Massospondylus sp., "Lizard" (Horizons not specified)	S A M Catalogue
	Rooinek	3027CB STERKSPRUIT	30°33′S 27°26′E	Elliot Fm. (L) : Melanorosaurus readi	Haughton 1924
	Mlamli	3027CB STERKSPRUIT	30°33′S 27°28′E	Elliot Fm. (U) : Massospondylus sp., Diarthrognathus sp., "ornithischian"	S A M Catalogue
				Elliot Fm. (M) : "Ornithischian"	S A M Catalogue
	Blikana Mountain	3027DA BLIKANA	30°34′S 27°37′E	Elliot Fm. (M) : Pachygenelus sp., Massospondylus harriesi	Charig et al. 1965; S A M Catalogue
				Elliot Fm. (L) : "Blikana dinosaur", Melanorosaurus sp.	
	"Voisana" (Voyizane, Foisani)	3027CB STERKSPRUIT	30°34′S 27°26′E	Elliot Fm. (U) : Heterodontosaurus tucki, Massospondylus sp., Thecodontosaurus sp., "ornithischian"	S A M Catalogue
	Majubas Nek	3027DA BLIKANA	30°34′S 27°30′E	Elliot Fm. : Massospondylus sp., Thecodontosaurus sp., 'Aetosaurus" (sic) (Horizons not specified)	S A M Catalogue
	Fort Hook	3027DA BLIKANA	30°35′S 27°35′E	Elliot Fm. (L) : Euskelosaurus sp.	S A M Catalogue
	Bensonvale Valley	3027CB STERKSPRUIT	30°36′S 27°20′E	Elliot Fm. (L) : Euskelosaurus sp.	S A M Catalogue
	Josanna's Nek (Bensonvale)	3027CB STERKSPRUIT	30°37′S 27°20′E	Elliot Fm. (U) : Massospondylus sp.	S A M Catalogue
	*Thaba Nyama	3027CB STERKSPRUIT	(?)30°37′S 27°20′E	Elliot Fm. (L) : *Melanorosaurus readi	*Haughton 1924
	Rockcliff	3027DA BLIKANA	30°38′S 27°28′E	Elliot Fm. (L) : Euskelosaurus sp.	S A M Catalogue

TABLE 2 : "STORMBERG" TETRAPOD FOSSIL LOCALITIES IN LESOTHO – COLLECTIONS OTHER THAN BPI

LOCALITY NAME *Denotes TYPE LOCALITY	1:50 000 MAP SHEET AND TITLE	LOCALITY CO-ORDINATES (best available estimate)		STRATIGRAPHY AND FOSSILS RECORDED (Stratigraphy re-interpreted; cf. Ellenberger - next column) U = upper; M = middle; L = lower) (Synonymy not considered - see text) *Denotes TYPE SPECIMEN		STRATIGRAPHIC HORIZON ACCORDING TO ELLENBERGER 1970	REFERENCE OR SOURCE *Denotes TYPE DESCRIPTION
Leribe-Subeng	2828CC IONIA	28° 50′S	28° 04′E	Elliot Fm. (L)	: *Belesodon leribeensis* (nom. nud.), *Melanorosaurus* sp., "pseudosuchian"	Zone A/4 (Upper Molteno *b*); Zone A/5 (Lower Red Beds *a*)	Ellenberger 1970; SAM Catalogue
*Lerily (?Leribe)	2828CC IONIA	28° 52′S	28° 02′E	Elliot Fm. (L?)	: **Basutodon ferox* (tooth)	Zone A/5 (Lower Red Beds *a*)	*Von Huene 1932; Ellenberger 1970
Mosethe	2927BB NO TITLE	29° 06′S	27° 47′E	Elliot Fm. (U?)	: *Gryponyx* sp., *Aetonyx* sp.	Zone B/2 (Transition Beds II, "Upper Red Beds *a*")	Ellenberger 1970
Moshele-Cana	2927BB NO TITLE	29° 07′S	27° 50′E	Elliot Fm. (U)	: *Gryponyx* sp.	Zone B/1 ("Transition Beds I", "Middle Red Beds", "Upper Red Beds *A*")	Ellenberger 1970
Maseru	2927AB KOMMISSIEPOORT	29° 19′S	27° 28′E	Elliot Fm.	: *Gryponyx* sp. (Horizon not specified)	– – –	SAM Catalogue
Botsabelo	2927BC NO TITLE	29° 20′S	27° 31′E	Elliot Fm. (L)	: cf. *Melanorosaurus* sp., "amphibian remains"	Zone A/3 (Upper Molteno *a*); Zone A/5 (Lower Red Beds *a*)	Ellenberger 1970
*Thaba Tseou	2927CD NO TITLE	29° 48′S	27° 25′E	Elliot Fm. (M?)	: **Tritylodon longaevus*	Zone B/2 (Transition Beds II; "Upper Red Beds *a*")	*Owen 1884; Ellenberger and Ginsburg 1965
*Tsekong	2927CD NO TITLE	29° 50′S	27° 15′E	Elliot Fm. (U)	: **Erythrotherium parringtoni*	– – –	*Crompton 1964(but C.E. Gow, pers. comm. 1983, says that he collected the holotype not from near Tsekong, but from a point about 5 km southeast of Likhoele).
*Likhoele	2927CD NO TITLE	29° 51′S	27° 16′E	Elliot Fm. (U)	: *Erythrotherium* sp., **Fabrosaurus australis* *Likhoeletherium* (nom. nud.), **Lesothosaurus diagnosticus*, cf. *Massospondylus* sp.	Zone B/3 (Transition Beds III, "Upper Red Beds *c*", "Basic Cave Sandstone"	*Ginsburg 1964; Ellenberger 1970; *Galton 1978
				Elliot Fm. (M?)	: **Likhoelia ellenbergeri*, *Tritylodon* sp., *Belesodon* sp. (nom. nud.)	Zone B/2 (Transition Beds II; "Upper Red Beds *a*") Zone A/4 (Upper Molteno *b*)	*Ginsburg 1961, 1962; SAM Catalogue
				Elliot Fm. (L)	: *Euskelosaurus* sp., *Likhoelesaurus ingens* (nom. nud.)	Zone A/5 (Lower Red Beds *a*)	Ellenberger 1970; SAM Catalogue
Maboloka	2927CD NO TITLE	29° 53′S	27° 21′E	Elliot Fm. (L)	: cf. *Melanorosaurus* sp.	Zone A/5 (Lower Red Beds *a*)	Ellenberger 1970
Thabana Morena	2927CD NO TITLE	29° 56′S	27° 25′E	Elliot Fm. (U?)	: cf. *Gryponyx* sp., "crocodilian"	Zone B/1 ("Transition Beds I", "Middle Red Beds", "Upper Red Beds *A*")	Ellenberger 1970
*Sekakes	3028AB PACK OX NEK	30° 02′S	28° 21′E	Elliot Fm. (U)	: "Ornithischian", **Orthosuchus stormbergi*	– – –	*Nash 1968, 1975
				Elliot Fm. (L)	: *Euskelosaurus* sp.	– – –	SAM Catalogue
*Nosi (Noosi)	3028BA NO TITLE	30° 03′S	28° 32′E	Elliot Fm. (U)	: **Abrictosaurus consors*	– – –	Thulborn 1970, 1974; *Hopson 1975
Maphutseng	3027AB MAGALENGBRUG	30° 13′S	27° 30′E	Elliot Fm. (U?)	: "*Archosaurus* sp." (sic)	Zone B/1 ("Transition Beds I", "Middle Red Beds", "Upper Red Beds *A*")	Ellenberger 1970
Mekaling	3027AD DULCIES NEK	30° 18′S	27° 29′E	Elliot Fm. (L)	: "large capitosaur"	Zone A/4 (Upper Molteno *b*)	Ellenberger 1970
*Pokane	3027BD NO TITLE	30° 20′S	27° 45′E	Elliot Fm. (U)	: *Heterodontosaurus* sp., "ornithischian"	Zone B/1 ("Transition Beds I","Middle Red Beds", "Upper Red Beds *A*")	SAM Catalogue
				Elliot Fm. (M)	: **Megazostrodon rudnerae*, *Tritylodon* sp.	Zone B/2 ("Transition Beds II","Upper Red Beds *a*")	*Crompton and Jenkins 1968; Ellenberger 1970
*Morobong Hill	3027BC PALMIETFONTEIN	30° 31′S	27° 29′ E	Elliot Fm. (L)	: **Scalenodotoides macrodontes*, cf. *Melanorosaurus* sp.	Zone A/3 (Upper Molteno *a*)	*Crompton and Ellenberger 1957; Cox 1969; Ellenberger 1970; Turner 1972
Masitisi	3027BC PALMIETFONTEIN	30° 24′S	27° 31′E	Elliot Fm. (U?)	: *Massospondylus* sp.	Zone B/1 ("Transition Beds I", "Middle Red Beds", "Upper Red Beds *A*")	Ellenberger 1970
				Elliot Fm. (M?)	: *Masitisitherium primordialis* (nom. nud.)	Zone A/7 (Lower Red Beds *c*)	Ellenberger 1970
Quthing	3027BC PALMIETFONTEIN	30° 24′S	27° 41′E	Elliot Fm. (U?)	: *Thecodontosaurus browni*, *Gryponyx taylori*	Zone B/1 ("Transition Beds I","Middle Red Beds", "Upper Red Beds *A*")	SAM Catalogue; Ellenberger 1970
Moyeni	3027BD NO TITLE	30° 25′S	27° 45′E	Elliot Fm. (U?)	: *Pachygenelus* sp.	Zone B/2 (Transition Beds II, "Upper Red Beds *a*")	Ellenberger 1970
Tele	3027BC PALMIETFONTEIN	30° 26′S	27° 36′E	Elliot Fm. (L)	: *Euskelosaurus* sp.	Zone A/4 (Upper Molteno *b*)	Ellenberger 1970
Dangershoek	3027DB BEN MACDHUI	30° 37′S	27° 48′E	Elliot Fm.	: "Ornithischian", *Massospondylus* sp. (Horizon not specified)	– – –	SAM Catalogue
Mahlakeng	NOT LOCATED	–	–	Elliot Fm. (L)	: cf. *Melanorosaurus* sp.	Zone A/5 (Lower Red Beds *a*)	Ellenberger 1970
Makhoajaneng	NOT LOCATED	–	–	Elliot Fm. (M?)	: *Tritylodon* sp., "ornithischian"	Zone A/7 (Lower Red Beds *c*)	Ellenberger 1970
Makhate	NOT LOCATED	–	–	Elliot Fm. (M?)	: *Tritylodon* sp.	Zone B/2 (Transition Beds II, "Upper Red Beds *a*")	Ellenberger 1970
Matsepe	NOT LOCATED	–	–	Elliot Fm. (U?)	: "*Thecodontosaurus* cf. *minimus*" (sic)	Zone B/1 ("Transition Beds I","Middle Red Beds", "Upper Red Beds *A*")	Ellenberger 1970
				Elliot Fm. (U?)	: *Erythrotherium parringtoni*, *Tritylodon* sp.	Zone B/2 (Transition Beds II, "Upper Red Beds *a*")	Ellenberger 1970
Ntsemo	NOT LOCATED	–	–	Elliot Fm. (U?)	: "*Archosaurus* sp." (sic)	Zone B/1 (Transition Beds I","Middle Red Beds", "Upper Red Beds *A*")	Ellenberger 1970
Makoloane	NOT LOCATED	–	–	Elliot Fm. (U?)	: *Massospondylus* sp.	Zone B/1 ("Transition Beds I","Middle Red Beds", "Upper Red Beds *A*")	Ellenberger 1970

TABLE 3 : "STORMBERG" TETRAPOD FOSSIL LOCALITIES – MAINLY IN SOUTH AFRICA– BPI COLLECTIONS

MAGISTERIAL DISTRICT	LOCALITY NAME (Numbers are farm identification numbers) *Denotes TYPE LOCALITY	1:50 000 MAP SHEET AND TITLE	LOCALITY CO-ORDINATES	STRATIGRAPHY AND FOSSILS RECORDED U = upper; M = middle; L = lower (Synonymy not considered – see text) *Denotes TYPE DESCRIPTION	REFERENCE OR SOURCE *Denotes TYPE DESCRIPTION
BETHLEHEM	Uniondale (867)	2827BD PAUL ROUX	28° 22′S 27° 59′E	Elliot Fm.(U) : *Massospondylus* sp.	BPI Catalogue and Field Notes
	Vergenoeg (1462)	2827BD PAUL ROUX	28° 25′S 27° 58′E	Elliot Fm.(L) : cf. *Euskelosaurus* sp.	BPI Catalogue and Field Notes
	Vallombrosa (1216)	2828AD JORDAANRIVIER	28° 25′S 28° 30′E	Elliot Fm.(M) : *Tritylodon* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(L) : cf. *Euskelosaurus* sp.	
	Bramleyshoek (52)	2828BC KESTELL	28° 25′S 28° 30′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(M) : *Tritylodon* sp., cf. *Massospondylus* sp.	
				Elliot Fm.(L) : cf. *Euskelosaurus* sp., capitosaur amphibian skull frags.	
	Elim (842)	2828BC KESTELL	28° 29′S 28° 25′E	Elliot Fm.(M) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(L) : cf. *Euskelosaurus* sp.	
	Boshoek (1264)	2828BC KESTELL	28° 30′S 28° 26′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(M) : *Tritylodon* sp., cf. *Massospondylus* sp.	
				Elliot Fm.(L) : cf. *Euskelosaurus* sp.	
	Noupoortsnek (578)	2828BC KESTELL	28° 30′S 28° 25′E	Elliot Fm.(L) : cf. *Euskelosaurus* sp.	BPI Catalogue and Field Notes
	Cornelia (1204)	2828BC KESTELL	28° 30′S 28° 26′E	Elliot Fm.(M) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	*Rooidraai/Buck Camp, Golden Gate Highlands National Park	2828DA GOLDEN GATE	28° 30′S 28° 37′E	Clarens Fm. (L) : cf. *Pachygenelus* sp., crocodilian, cf. *Massospondylus* sp., small thecodont	BPI Catalogue and Field Notes
				Elliot Fm.(U) : *Pachygenelus monus*, **Clarencea gracilis*, **Lanasaurus scalpridens*, Indet. dinosaurian eggs, cf. *Massospondylus* sp.	*Brink 1959; Gow*1975, 1980; Kitching 1979; BPI Catalogue and Field Notes
	Glen Reenen (1361)	2828DA GOLDEN GATE	28° 30′S 28° 37′E	Clarens Fm. (L) : cf. *Pachygenelus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Clarens Townlands	2828CB CLARENS	28° 31′S 28° 25′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Friesland West (371)	2828CB CLARENS	28° 31′S 28° 31′E	Elliot Fm.(L) : cf. *Euskelosaurus* sp., capitosaur amphibian skull frags.	BPI Catalogue and Field Notes
	*Sunnyside (1178)	2828CB CLARENS	28° 32′S 28° 31′E	Elliot Fm.(U) : cf. *Notochampsa* sp., **Baroqueosuchus haughtoni*	BPI Catalogue and Field Notes; Busbey & Gow, this volume
				Elliot Fm.(M) : *Tritylodon* sp., cf. *Massospondylus* sp.	
	Tevrede (1077)	2828CB CLARENS	28° 32′S 28° 30′E	Clarens Fm. (L) : *Massospondylus* sp., cf. *Heterodontosaurus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
FOURIESBURG	Caledon Park [part of Dunblane (335)]	2828CB CLARENS	28° 33′S 28° 23′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(M) : *Tritylodon* sp., cf. *Massospondylus* sp.	
	St Fort [Letsoana Stad (347)]	2828CB CLARENS	28° 33′S 28° 25′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(M) : *Tritylodon* sp., *Pachygenelus* sp., cf. *Massospondylus* sp.	
	Linnwood [Geluk (35)]	2828CB CLARENS	28° 34′S 28° 24′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Bloemhoek (330)	2828CB CLARENS	28° 36′S 28° 17′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(M) : *Tritylodon* sp., cf. *Massospondylus* sp.	
	Saaihoek (194) [Zaaihoek]	2828CB CLARENS	28° 37′S 28° 16′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(M) : *Tritylodon* sp., cf. *Massospondylus* sp.	
				Elliot Fm.(L) : cf. *Euskelosaurus* sp.	
	Mooihoek (348)	2828CB CLARENS	28° 37′S 28° 25′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	La France (379)	2828CB CLARENS	28° 37′S 28° 16′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(L) : cf. *Euskelosaurus* sp.	
	Naudes Lust (334)	2828CB CLARENS	28° 37′S 28° 19′E	Elliot Fm.(M) : *Tritylodon* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(L) : cf. *Euskelosaurus* sp.	
	Helpmekaar (251)	2828CA/CB FOURIESBURG/CLARENS	28° 38′S 28° 15′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Mizpah (164)	2828CA/CB FOURIESBURG/CLARENS	28° 39′S 28° 20′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Foutanie (331)	2828CA/CB FOURIESBURG/CLARENS	28° 40′S 28° 15′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(L) : cf. *Euskelosaurus* sp., thecodont (?rauisuchid)	
	Groot Verwulf (274)	2828CB CLARENS	28° 40′S 28° 17′E	Elliot Fm.(U) : cf. *Massospondylus* sp., crocodilian remains	BPI Catalogue and Field Notes
				Elliot Fm.(L) : cf. *Euskelosaurus* sp., large thecodont jaw (?rauisuchid)	
	Bestersvlei (186)	2828CA FOURIESBURG	28° 41′S 28° 11′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Langkloof (34)	2828CA FOURIESBURG	28° 41′S 28° 19′E	Elliot Fm.(M) : *Tritylodon* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(L) : cf. *Euskelosaurus* sp., capitosaur amphibian skull frags.	
	De Villiersdrift (338)	2828CB CLARENS	28° 41′S 28° 19′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(M) : cf. *Massospondylus* sp.	
				Elliot Fm.(L) : cf. *Euskelosaurus* sp., capitosaur amphibian jaw frags.	
MARQUARD	Môreson (407)	2827CC EXCELSIOR	28° 47′S 27° 14′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Magetzane (292)	2927CC EXCELSIOR	28° 47′S 27° 14′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Breslers Flat (298)	2927CC EXCELSIOR	28° 47′S 27° 13′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
WINBURG	Van Soelenshoek (590)	2827CD MEKOATLENGSNEK	28° 52′S 27° 16′E	Elliot Fm.(M) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm.(L) : cf. *Euskelosaurus* sp.	
	Magermanshoek (588)	2827CD MEKOATLENGSNEK	28° 52′S 27° 16′E	Elliot Fm.(U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes

(Table 3 cont.)

MAGISTERIAL DISTRICT	LOCALITY NAME (Numbers are farm identification numbers) *Denotes TYPE LOCALITY	1:50 000 MAP SHEET AND TITLE	LOCALITY CO-ORDINATES	STRATIGRAPHY AND FOSSILS RECORDED U = upper; M = middle; L = lower (Synonymy not considered – see text) *Denotes TYPE DESCRIPTION	REFERENCE OR SOURCE *Denotes TYPE DESCRIPTION
CLOCOLAN	Dennelaan (148)	2827CD MEKOATLENGSNEK	28° 57′S 27° 26′E	Elliot Fm. (U) : *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm. (M) : cf. *Massospondylus* sp.	
	*Bormansdrift (133)	2827CD MEKOATLENGSNEK	28° 57′S 27° 26′E	Elliot Fm. (U) : *Pachygenelus* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm. (M) : *Massospondylus* sp., *new chelonian	
				Elliot Fm. (L) : cf. *Euskelosaurus* sp.	
	Gertruida (38) [De Rust]	2827CD MEKOATLENGSNEK	28° 57′S 27° 25′E	Elliot Fm. (U) : cf. *Erythrotherium* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Helpmekaar (71)	2827CD MEKOATLENGSNEK	28° 58′S 27° 28′E	Elliot Fm. (U) : cf. *Fabrosaurus* sp., cf. *Massospondylus* sp.	
				Elliot Fm. (M) : *Tritylodon* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Mequatlingsnek (315)	2827CD MEKOATLENGSNEK	28° 58′S 27° 19′E	Elliot Fm. (U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm. (M) : *Pachygenelus* sp., cf. *Massospondylus* sp.	
				Elliot Fm. (L) : cf. *Euskelosaurus* sp., ?*Basutodon* tooth	
	Mequatling (278)	2827CD MEKOATLENGSNEK	28° 59′S 27° 22′E	Elliot Fm. (U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm. (M) : *Tritylodon* sp., *Pachygenelus* sp., *Syntarsus* sp., cf. *Fabrosaurus* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes; Raath 1980
				Elliot Fm. (L) : cf. *Euskelosaurus* sp., capitosaur amphibian jaw frags.	BPI Catalogue and Field Notes
	Nova Barletta (307)	2827CD MEKOATLENGSNEK	28° 59′S 27° 23′E	Elliot Fm. (M) : *Tritylodon* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm. (L) : cf. *Euskelosaurus* sp.	
LADYBRAND	Rhodes (281)	2927BA KILMARNOCK	29° 00′S 27° 31′E	Elliot Fm. (U) : *Pachygenelus* sp., conchostracans	BPI Catalogue and Field Notes
				Elliot Fm. (M) : *Tritylodon* sp.	
	Klein Kilmarnock (390)	2927AB LADYBRAND	29° 02′S 27° 29′E	Elliot Fm. (M) : *Tritylodon* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm. (L) : cf. *Euskelosaurus* sp.	
	Rustig (86)	2927AB LADYBRAND	29° 02′S 27° 29′E	Elliot Fm. (U) : cf. *Erythroherium* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Vroolykheid (284)	2927AB LADYBRAND	29° 03′S 27° 27′E	Elliot Fm. (M) : *Tritylodon* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm. (L) : cf. *Euskelosaurus* sp.	
	Twee Zusters (251)	2927AB LADYBRAND	29° 03′S 27° 26′E	Elliot Fm. (M) : *Tritylodon* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm. (L) : cf. *Euskelosaurus* sp.	
	Emmaus (355)	2927AB LADYBRAND	29° 03′S 27° 31′E	Elliot Fm. (U) : Indet. dinosaur eggs	BPI Catalogue and Field Notes
				Elliot Fm. (M) : *Tritylodon* sp., cf. *Massospondylus* sp.	
				Elliot Fm. (L) : ? *Basutodon* teeth	
	Mowbray (287)	2927AB LADYBRAND	29° 03′S 27° 26′E	Elliot Fm. (M) : *Tritylodon* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Straalfontein (117)	2927AB LADYBRAND	29° 04′S 27° 19′E	Elliot Fm. (U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm. (L) : cf. *Euskelosaurus* sp.	
	Oldenburg (45)	2927AB LADYBRAND	29° 04′S 27° 24′E	Elliot Fm. (M) : *Tritylodon* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Winterhoek (329)	2927AB LADYBRAND	29° 04′S 27° 30′E	Elliot Fm. (U) : Crocodilian	BPI Catalogue and Field Notes
				Elliot Fm. (M) : *Tritylodon* sp., cf. *Fabrosaurus* sp., *Syntarsus* sp., cf. *Massospondylus* sp.	
				Elliot Fm. (L) : cf. *Euskelosaurus* sp.	
	Roodebloem (334)	2927AB LADYBRAND	29° 05′S 27° 22′E	Elliot Fm. (M) : *Tritylodon* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm. (L) : Large thecodont (?rauisuchid)	
	Modderpoort (34)	2927AB LADYBRAND	29° 05′S 27° 26′E	Elliot Fm. (M) : *Tritylodon* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Paradys (104)	2927AB LADYBRAND	29° 06′S 27° 20′E	Elliot Fm. (U) : *Pachygenelus* sp.	BPI Catalogue and Field Notes
				Elliot Fm. (M) : *Tritylodon* sp., cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Welbedacht (611)	2927AB LADYBRAND	29° 06′S 27° 20′E	Elliot Fm. (M) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm. (L) : cf. *Euskelosaurus* sp.	
	Edelweiss (698)	2927AB LADYBRAND	29° 06′S 27° 19′E	Elliot Fm. (M) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
				Elliot Fm. (L) : cf. *Euskelosaurus* sp.	
	Modderpoort Spruit (35)	2927AB LADYBRAND	29° 07′S 27° 27′E	Elliot Fm. (U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Broken Slopes (793)	2927AB LADYBRAND	29° 08′S 27° 19′E	Elliot Fm. (U) : cf. *Ceratodus* sp., conchostracans	BPI Catalogue and Field Notes
				Elliot Fm. (M) : cf. *Massospondylus* sp., brachyopid amphibian, conchostracans	
	Vastrap (804)	2927AB LADYBRAND	29° 08′S 27° 20′E	Elliot Fm. (U) : Brachyopid amphibian, cf. *ceratodus* sp. (tooth plates plus partial skeletons), conchostracans	BPI Catalogue and Field Notes
				Elliot Fm. (M) : *Tritylodon* sp., *Syntarsus* sp., cf. *Massospondylus* sp.	
	Diepgesicht (54)	2927AB LADYBRAND	29° 08′S 27° 21′E	Clarens Fm. (M) : Large carnosaur teeth	BPI Catalogue and Field Notes
				Elliot Fm. (U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	St Elmo (699)	2927AB LADYBRAND	29° 08′S 27° 22′E	Elliot Fm. (U) : *Pachygenelus* sp., cf. *Massospondylus* sp. ?thecodont	BPI Catalogue and Field Notes
	Lelichoek [Ladybrand Townlands]	2927AB LADYBRAND	29° 12′S 27° 26′E	Elliot Fm. (U) : *Syntarsus* sp., cf. *Fabrosaurus* sp., "archosaurian"	BPI Catalogue and Field Notes
	Newlands (42)	2927AB LADYBRAND	29° 14′S 27° 21′E	Elliot Fm. (U) : cf. *Fabrosaurus* sp., cf. *Massospondylus* sp., *Baroqueosuchus*	BPI Catalogue and Field Notes; Busbey & Gow, this volume.
				Elliot Fm. (M) : *Tritylodon* sp.	
HERSCHEL	St. Michaels Mission	3027AD DULCIES NEK	30° 28′S 27° 26′E	Elliot Fm. (U) : *Pachygenelus* sp., crocodilian remains	BPI Catalogue and Field Notes
	Voyizanc	3927CB STERKSPRUIT	30° 34′S 27° 26′E	Elliot Fm. (L) : "prosauropod remains"	BPI Catalogue and Field Notes
	Blikana Mountain	3027DA BLIKANA	30° 34′S 27° 37′E	Elliot Fm. (M) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
	Rockcliff	3027DA BLIKANA	30° 38′S 27° 28′E	Elliot Fm. (M) : "dinosaurian ankle"	BPI Catalogue and Field Notes
WODEHOUSE	Donkerpoort [part of Waaihoek]	3027DA BLIKANA	31° 06′S 27° 08′E	Elliot Fm. (L) : cf. *Euskelosaurus* sp.	BPI Catalogue and Field Notes
	Waaihoek	3027DA BLIKANA	31° 07′S 27° 07′E	Elliot Fm. (L) : cf. *Euskelosaurus* sp.	BPI Catalogue and Field Notes
	Waterval	3127AA SWEMPOORT	31° 08′S 27° 06′E	Elliot Fm. (L) : cf. *Euskelosaurus* sp.	BPI Catalogue and Field Notes
ALBERT (BURGERSDORP)	Witkop	3126BA WITKOP	31° 09′S 26° 37′E	Elliot Fm. (U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes
LESOTHO	Thaba Tsoou	3028AB PACK OX NEK	30° 05′S 28° 28′E	Elliot Fm. (U) : cf. *Massospondylus* sp.	BPI Catalogue and Field Notes

TABLE 4 : TAXONOMIC STATUS OF TETRAPOD TAXA FROM THE ELLIOT AND CLARENS FORMATIONS

Informal Group	Genus	Species recorded in Elliot and Clarens Fm., with original reference	Taxonomic status and notes (for references see list below table) (Jun. syn = junior synonym)
Eotherian mammals	*ERYTHROTHERIUM*	*E. parringtoni* Crompton 1964	**Valid** [Ref. 10]
	LIKHOELETHERIUM	(no name) Ellenberger 1970	*Nomen nudum*
	MEGAZOSTRODON	*M. rudnerae* Crompton and Jenkins 1968	**Valid** [Ref. 10]
Advanced cynodonts	*BELESODON*	*B. leribeensis* Ellenberger 1970	*Nomen nudum*
	DIARTHROGNATHUS	*D. broomi* Crompton 1958	Jun. syn. *Pachygenelus monus* [Ref. 9 (but see Ref. 7)]
	LIKHOELIA	*L. ellenbergeri* Ginsburg 1961	Jun. syn. *Tritylodon longaevus* [Ref. 9]
	MASITISITHERIUM	*M. primordialis* Ellenberger 1970	*Nomen nudum*
	PACHYGENELUS	*P. monus* Watson 1913	**Valid** [Ref. 9]
	SCALENODONTOIDES	*S. macrodontes* Crompton & Ellenberger 1957	**Valid** [Ref. 9]
	TRITHELEDON	*T. riconoi* Broom 1912	**Valid** [Ref. 9]
	TRITYLODON	*T. longaevus* Owen 1884	**Valid** [Ref. 9]
	TRITYLODONTOIDES	*T. maximus* Fourie 1963	?Jun. syn. *Tritylodon longaevus* [Ref. 9]
	TRITYLODONTOIDEUS	*T. maximus* Fourie 1962	(Same specimen as *Tritylodontoides*, therefore syn. *Tritylodon*)
Fabrosaurid ornithischians	*FABROSAURUS*	*F. australis* Ginsburg 1964	?**Valid** (but see Ref. 2, ?invalid)
	LESOTHOSAURUS	*L. diagnosticus* Galton 1978	?**Valid** (but see Ref. 7 – ?jun. syn. *Fabrosaurus*)
Heterodontosaurid ornithischians	*ABRICTOSAURUS*	*A. consors* Hopson 1975	**Valid** (removed from *Lycorhinus*) [Ref. 8]
	HETERODONTOSAURUS	*H. tucki* Crompton & Charig 1962	**Valid** [Ref. 2]
	LANASAURUS	*L. scalpridens* Gow 1975	?**Valid**
	LYCORHINUS	*L. angustidens* Haughton 1924	**Valid** [Ref. 2]
		L. consors	Jun. syn. *Abrictosaurus consors* [Ref. 8]
Ornithischian	*GERANOSAURUS*	*G. atavus* Broom 1911	?**Valid** (affinities uncertain)
Small to medium-sized prosauropod saurischians	*AETONYX*	*A. palustris* Broom 1911	Jun. syn. *Massospondylus carinatus* [Ref. 4]
	ARISTOSAURUS	*A. erectus* v. Hoepen 1920a	Jun. syn. *M. carinatus* [Ref. 4]
	DROMICOSAURUS	*D. gracilis* v. Hoepen 1920b	Jun. syn. *M. carinatus* [Ref. 4]
	GRYPONYX	*G. africanus* Broom 1911	Jun. syn. *M. carinatus* [Ref. 4]
		G. taylori Haughton 1924	Jun. syn. *M. carinatus* [Ref. 4]
	GYPOSAURUS	*G. capensis* v. Huene 1932 (non Broom 1906)	Jun. syn. *M. carinatus* [Ref. 4] (but see Ref. 6)
		G. erectus (v.Hoepen) Charig 1967	Jun. syn. *M. carinatus* [Ref. 4] (but see Ref. 6)
		G. skirtopodus (Seeley) Charig 1967	Jun. syn. *M. carinatus* [Ref. 4] (but see Ref. 6)
	HORTALOTARSUS	*H. skirtopodus* Seeley 1894	Jun. syn. *M. carinatus* [Ref. 4] (but see Ref. 6)
	LEPTOSPONDYLUS	*L. capensis* Owen 1854	Jun. syn. *M. carinatus* [Ref. 4]
	MASSOSPONDYLUS	*M. browni* Seeley 1895	Jun. syn. *M. carinatus* [Ref. 4]
		M. carinatus Owen 1854	**Valid** [Ref. 4]
		M. harriesi Broom 1911	Jun. syn. *M. carinatus* [Ref. 4]
		M. schwarzi Haughton 1924	Jun. syn. *M. carinatus* [Ref. 4]
	PACHYSPONDYLUS	*P. orpenii* Owen 1854	Jun. syn. *M. carinatus* [Ref. 4]
	THECODONTOSAURUS	*T. browni* (Seeley) v. Huene 1906	Jun. syn. *M. carinatus* [Ref. 4]
		T. dubius Haughton 1924	Jun. syn. *M. carinatus* [Ref. 4]
		T. minor Haughton 1924	Jun. syn. *M. carinatus* [Ref. 4]
		T. cf. *minimus* Ellengerger 1970	*Nomen nudum*
		T. skirtopodus (Seeley) v. Huene 1906	Jun. syn. *M. carinatus* [Ref. 4]
Large prosauropod saurischians	*BASUTODON*	*B. ferox* v. Huene 1932	?Jun. syn. *Euskelosaurus browni* [Ref. 3](but see text – ?rauisuchid)
	EUCNEMESAURUS	*E. fortis* v. Hoepen 1920b	Jun. syn. *E. browni* [Ref. 3](see also Ref. 12)
	EUSKELESAURUS	*E. africanus* Haughton 1924	Jun. syn. *E. browni* [Ref. 3]
		E. brownii Huxley 1867	Jun. syn. *E. browni* [Ref. 3]
		E. capensis (Lydekker) Haughton 1924	Jun. syn. *E. browni* [Ref. 3](see also Ref. 12)
	EUSKELOSAURUS	*E. africanus* (Haughton) v. Huene 1932	Jun. syn. *E. browni* [Ref. 3]
		E. browni (Huxley) v. Huene 1906	**Valid** [Ref. 3]
		E. brownii Huxley 1866	=*E. browni*
		E. capensis (Lydekker) v. Huene 1906	Jun. syn. *E. browni* [Ref. 3](see also Ref. 12)
	LIKHOELESAURUS	*L. ingens* Ellenberger 1970	?Jun. syn. *Basutodon* (tooth only; ?rauisuchid)[Ref. 3]
	MELANOROSAURUS	*M. readi* Haughton 1924	Jun. syn. *Euskelosaurus browni* [Ref. 3](see also Ref. 12)
	ORINOSAURUS	*O. capensis* Lydekker 1889	Jun. syn. *E. browni* [Ref. 3](see also Ref. 12)
	OROSAURUS	(no name) Huxley 1867	?Jun. syn. *E.browni* [Ref. 3](see also Ref. 12)
	PLATEOSAURAVUS	*P. cullingworthi* (Haughton) v. Huene 1932	Jun. syn. *E. browni* [Ref. 3]
		P. stormbergensis (Haughton) Haughton & Brink 1954	Jun. syn. *E. browni* [Ref. 3](see also Ref. 12)
	PLATEOSAURUS	*P. cullingworthi* Haughton 1924	Jun. syn. *E. browni* [Ref. 3]
		P. stormbergensis Broom 1915	Jun. syn. *E. browni* [Ref. 3]
	ROCCOSAURUS	*R. tetrasacralis* J. van Heerden (unpubl.)	Cheironym
Small theropod saurischian	*SYNTARSUS*	(not stated; ?*S. rhodesiensis*)	**Valid** [Ref. 11]
Protosuchian crocodilians	*BAROQUEOSUCHUS*	*B. haughtoni* Busbey & Gow 1984	**Valid** (see description elsewhere in this volume)
	ERYTHROCHAMPSA	*E. longipes* (Broom) Haughton 1924	?**Valid** (but see Ref. 1?jun. syn; *Notochampsa*)
	NOTOCHAMPSA	*N. istedana* Broom 1904	**Valid** [Ref. 1]
		N. longipes Broom 1904	?**Valid** [Ref. 1]
	ORTHOSUCHUS	*O. stormbergi* Nash 1968	**Valid** [Ref. 1]
	PEDETICOSAURUS	*P. leviseuri* v. Hoepen 1915	?**Valid** [Ref. 1]
?Thecodontia	*CLARENCEA*	*C. gracilis* Brink 1959	?**Valid** (but see Ref. 5 – assigned to Protosuchia)
	SPHENOSUCHUS	*S. acutus* Haughton 1915	?**Valid** (but see Ref. 5 – assigned to Protosuchia)
	ARCHOSAURUS	*A. sp.* (sic) Ellenberger 1970	?*Lapsus calami* (*Archosaurus* is from Permian)

References:
Ref. 1 Busbey and Gow, 1984 (this volume)
Ref. 2 Charig and Crompton 1974
Ref. 3 Cooper 1980
Ref. 4 Cooper 1981
Ref. 5 Cooper 1982
Ref. 6 Galton 1976
Ref. 7 Gow 1981
Ref. 8 Hopson 1975
Ref. 9 Hopson and Kitching 1972
Ref. 10 Jenkins and Crompton 1979
Ref. 11 Raath 1980
Ref. 12 van Heerden 1979

(speaking of the Forest Sandstone Formation in what is now Zimbabwe) : "*Massospondylus* has a limited vertical range, and can almost be regarded as the index fossil for this zone of the Forest Sandstone" (Bond 1965:4).

We feel that the relative abundance of taxa in a narrow band at the top of the middle division of the Elliot Formation is worthy of emphasis, particularly the abundance of *Tritylodon* which was previously considered to be rare in these beds. Hence our proposal to designate the *Tritylodon* Acme-zone, lying within the more extensive *Massospondylus* Range Zone.

It is also considered worth drawing attention to the comparatively diverse fauna preserved in the uppermost layers of the Elliot Formation on and near the contact with the overlying Clarens Formation (fig. 2).

TAXONOMIC DIVERSITY IN THE ELLIOT AND CLARENS FORMATIONS : IS IT REAL?

Tables 1 and 2 reflect the taxonomic proliferation that has characterized work on the vertebrate fauna of the Elliot Formation and Clarens Formation in the past. Many of those taxa are based on lamentably inadequate material, much of which is probably indeterminable, so that several are undoutedly merely *nomina dubia.* Even in those cases where the taxa are based on material that can be regarded as adequate it seems clear to us that insufficient cognizance has been taken of such basic (and taxonomically irrelevant) variables as individual variation, sexual dimorphism, the effects of growth and allometry, or even simply distortion due to overlying sediment load. These factors amongst others have resulted in what we consider to be an artificial impression of faunal diversity at a time of harsh environmental conditions during the deposition of the Elliot Formation and Clarens Formation (Tucker and Benton 1982). We are especially sceptical about the number of dinosaurian (both orders) and protosuchian crocodilian taxa that have been introduced in view of the close similarity in size and general skeletal adaptations of most taxa within each order. Consequently, in the absence of compelling evidence to the contrary, we are inclined to agree with several recent authors who have "lumped" many of the taxa (e.g. Galton 1976; Galton and Cluver 1976; Van Heerden 1979; Cooper 1980, 1981, 1982). Because of the current unsettled state of prosauropod dinosaur taxonomy, we refer in Table 3 to the large prosauropod dinosaurs from the lower parts of the Elliot Formation as "cf. *Euskelosaurus* sp." and to the more abundant small-to-medium sized prosauropods, ranging from the basal horizons of the middle part of the Elliot Formation into the base of the Clarens Formation, as "cf. *Massospondylus* sp.".

Current views on the taxonomic status of tetrapod taxa from these strata are summarised in Table 4.

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