A VERIFIED LIST OF THE LUFENG SAURISCHIAN FAUNA

by

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Introduction

The fossil vertebrates of the lower Lufeng Formation from the Lufeng Basin in Yunnan Province have been continuously recorded since the late 1930s, with the assemblage initially designated in 1950 as the Lufeng Saurischian Fauna (C.C. Young, 1951). At that time the recorded material consisted of 15 genera and 20 species (excluding the yet unassigned specimens). Major additions have increased this amount over the past 30 years, and C.C. Young's 1982 synthesis increased the quantity of taxa to 22 genera and 27 species.

The entire assemblage of fossil specimens from this region of Lufeng may be placed in three categories: The first category represents the collection that was made and studied since the 1930s by C.C. Young. Until recently, the precise whereabouts of some of the specimens was vague due to the collection coinciding with the resistance war against Japan, which caused the specimens to be shifted to various locations. The remainder of this collection is available at the Institute for Vertebrate Paleontology and Paleoanthropology in Beijing, the Beijing Geological Museum, and arranged on display at the Nanjing Office of Geology and Mineral Resources. The second category is the collection entrusted to H.W. Rigney of the former Catholic University that consists of microfossils initially collected by the Rev. Edgar T. Oehler from 1947 to 1949 and were subsequently smuggled out of the country. Later these specimens were distributed and studied by foreign scholars and are currently housed at the Chicago Field Museum in the United States. The third category is the collection made within the past thirty years by colleagues at the Institute of Vertebrate Paleontology and Paleoantrhopology. The Geological Museum also retains some material such as Lufeng mammals, *Bienotherium magnum*, and *Dawasaurus*. In addition, other organizations have also collected several specimens. However, as publications have not yet been observed relating to this material, they will not be included below.

Table 2: Stratigraphic column from Bian, 1941.

Stratigraphic designation		Thickness (meters)	Lithologic character
Upper Lufeng Series	Red sandstone	5-10	Red sandstone
Lower Lufeng Series	Deep Red sediments	150	Principally red interbedded mudstones, shales, siltstones, and sandstones. The second dinosaur bed is situated in the middle of the section
	Green massive sandstone	20	Green massive sandstone
	Dark purple sediments*	550	Principally composed of dark purple interbedded mudstone, shales, siltstones, and sandstones. the first dinosaur bed is ~200 m above the basal conglomerate
	Basal conglomerate	5-20	Dark purple or dark brown colored basal conglomerate

*C.C. Young (1982) believed the upper section of this deposit to be the fossiliferous strata, 30 m from the upper boundary at Dadi and 100 m at Heiguopeng. He referred to this unit as the Second Fossil Horizon. In addition, the upper section's deep red fossil deposit situated near the center of the measured section was considered the Third Fossil Horizon.

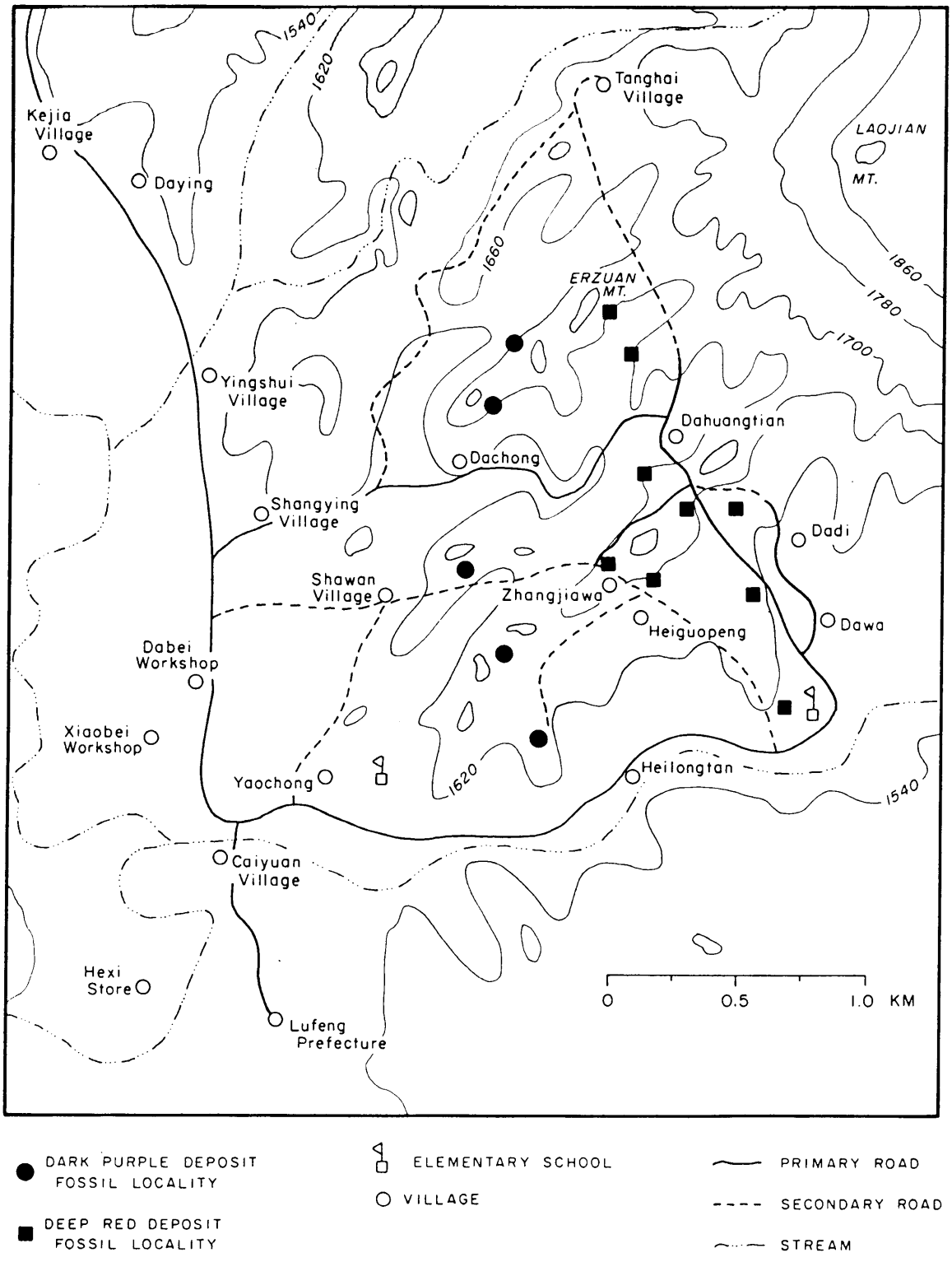

Figure 1. Fossil locality map of the lower Lufeng series at Dawa, Lufeng Co.

There is an unsettled dispute regarding the age of the lower Lufeng Formation. C.C. Young insisted, based on the vertebrate fossils, that the entire section occupied the Rhaetic Stage. Different opinions have been deduced from two other aspects: Early Jurassic, based upon paleobotany, palynology, and bivalves; and Rhaeto-Liassic, based upon crustal movement and depositional cycles (Dong Zhiming, 1980).

The authors believe that prior to formulating an opinion regarding a stratigraphic age, it is essential that the fossil vertebrates contained within the Lower Lufeng Formation are presented as reliable data for analysis. Because different fossil collectors' objectives had varied, disproportionate standards were set for stratigraphic subdivisions, which, in turn, created a confusion in the literature and formed many problems relating to the stratigraphic position of the productive fossil horizons. Some workers, when referring to the age and stratigraphic position of the fossils, ambiguously refer to the "Lower Lufeng System" or the "Upper Triassic" to the extent of creating contradictions within the same paper. As a result, this ambiguity has influenced the interpretation of the faunal complexion. The objective of this paper is to form a foundation for the later expansion of work by producing a reliable and detailed correlation of the vertebrate fossils from the Dark Purple and Deep Red Sequences that is supported by a genuine data base.

Table 3. Nanjing Institute of Paleontology, Chinese Academy of Sciences, et al. (1975)

Stratigraphic designation		Thickness (meters)	Lithologic character
Upper Lufeng Group	Yellow-green banded sediments	70	Dark-red shales and rippled siltstones grading into yellow green banded shales
Lower Lufeng Group	Red sandstones	5-10	(Should be considered massive dark red calcareous mudstones)
	Dark red sediments	150	Principally interbedded dark red mudstones, shales, siltstones and sandstones. The second dinosaur bed approaches the middle of the deposit. Also contains ostracods.
	Massive green sandstones	20	Massive green sandstones
	Dark purple sediments	550	Principally dark purple interbedded mudstones, shales, siltstones, and sandstones. The first dinosaur bed is approximately 200 m above the basal conglomerate. Also contains fish as well as ostracods and lamillibranchs
	Basal conglomerate	5-20	Dark purple or dark brown basal conglomerate

Phylogenetic summary

A taxonomic description of the known vertebrate fossils from the Lower Lufeng sequence is provided as follows.

1. Capitosauridae

In 1962 Sun Ailin recorded a string of vertebrae but did not state which horizon the specimen was derived from. It is now determined that the specimen should have been produced from the Deep Red Sequence based upon the lithological characters of the surrounding matrix and the locality being Heiguopeng.

2. Chelonia

Colleague Zhang Fakui discovered two fossil turtles in the Deep Red Sequence that he believes to belong to the Proganochelyidae.

3. ?Protorosauria

There is only a single posterior portion of a skull representing the protorosauria, which according to Zhao Xijin, is from the upper part of the Dark Purple Sequence at Dachong. When C.C. Young initiated his studies, he collected a surface concretion that he erroneously considered to display the specialized dentition of *Trilophosaurus*, and was subsequently designated *Neotrilophosaurus* although the publication has yet to be issued. This designation was quoted in some of the literature due to the requirement of stratigraphic studies at the time. Young reevaluated the specimen and renamed it *Dianosaurus*, but he still retained it in the Protorosauria. The nomenclature *Neotrilophosaurus* should therefore be abandoned. With regard to further revisions in the study of this fossil, as its true appearance has yet to be exposed, the authors reserve judgment regarding its assignment.

4. Pseudosuchia

There are four distinguishable taxa of Pseudosuchia that have been collected from the Lufeng Basin: *Platyognathus, Dibothrosuchus, Strigosuchus*, and an undetermined taxon (Simmons, 1965). This year a nearly complete pseudosuchian was discovered by the authors on the slope of North Mountain (Beishan) at Dawa Elementary School, which includes a skull, mandible and anterior portion of the skeleton. Based on preliminary observations by Xiaochun Wu, this specimen shares diagnostic characteristics attributed to the Sphenosuchidae. The characteristics include: squamosal elongated antero posteriorly and lacking a descending process; large otic notch; unique parietal and occipital crest; quadrate that is ascended, is extremely anteriorly inclined and penetrates the supratemporal fenestra to atain the skull roof; well developed posteroventral process projecting off the coracoid, and the carpus and anterior limbs displaying a crocodillian mode. The specimen was produced from unit 7 of Table 4, which is generally equivalent to the lower section of the Deep Red Sequence.

The type specimen of *Platyognathus* described by C.C. Young (1944) from Dahuangtian and the more recently added material described by Simmons from Dadi, were both produced from the Deep Red Sequence. Xiaochun Wu believes the skull material assigned to *Platyognathus* by Simmons bears a similarity to the new specimen collected by the authors. Its corocoid posteroventral process configuration is a diagnostic character for the Sphenosuchidae. However, the structure of the posterior elements of the skull is slightly different from the authors' specimen. As a result, the Simmons specimen may represent a new and different Spehosuchid. Simmons himself mentioned the characteristics similar to the Sphenosuchide in his paper.

Table 4: Southwestern Area Regional Stratigraphic Table from the Yunnan Province Handbook (1978)

Stratigraphic designation			Thickness (meters)	Lithologic characters
Upper Lufeng Fm.	Lower section	1	35.4	Interbedded yellow-green siltstones and dark brown mudstones with base as conglomerates
Lower Lufeng Fm.	Upper division*	9	45.3	Deep red mudstone grading into brown red siltstones
		8	132.6	Interbedded deep red and brown red mudstones with the base as sandstones. Contains fossil reptiles and ostracods
		7	25.5	Interbedded dark-purple, brown red, dark brown red mudstones and gray-green mudstones. Contains dinosaurs and crocodiles.
	Lower division!	6	64.3	Dark red-brown and dark purple interbedded mudstones grading into silty flagstone. Contains reptiles and ostracods.
		5	65.1	Dark purple and dark brown interbedded mudstones grading into siltstones. Contains reptiles
		4	82.1	Dark red-brown and dark purple mudstones with yellow green siltstones
		3	91.7	Dark purple mudstones grading into dark red mudstones and calcareous silty sandstones.
		2	208.5	Dark red-brown and dark purple interbedded mudstones grading into siltstones. Contains lamillibranchs and ostracods
		1	16.4	Dark purple or dark brown basal conglomerate

*Considered to be the Deep Red Deposits by the table's editors.

!Considered by the table's editors to represent the Dark Purple Deposits.

Viewpoints relating to the temporal divisions of the Lower Lufeng Formation at Lufeng may be observed in Table 1. Tables 2, 3, and 4 are measured sections from different fossil collectors which display different interpretations in stratigraphic subdivision. Table 3 is exactly the same as Table 2 with the exception of the upper boundary of the Lower Lufeng Formation in the red sandstone. Among the nine divisions in Table 4, with the exception of the lower conglomerate being considered in the same way as the prior two tables, it is hereby proposed that: beds 2-6 correspond, generally, to the Dark Purple Sequence, and beds 7-9 represent the Deep Red Sequence. This text temporarily adopts the Table 3 divisions, while concurrently making reference to the divisions of Table 4 in order to reach the objective of expressing a more detailed division of genera and species within the productive horizons.

Dibothrosuchus is based on a section of skull and relatively complete postcrania, while *Strigosuchus* is based upon an incomplete mandible. Both are assigned to the Ornithosuchiade and are produced from the Deep Red Sequence of Dadi.

C.C. Young (1982) noticed the presence of inconsistencies in Simmons' paper regarding the description of the Pseudosuchians and the stratigraphic position of the material produced from Dadi. He stated that "according to what is expressed in Table 2 of Simmons, 1965, these fossils were produced from the upper section of the Dark Purple Sequence in the Lower Lufeng Formation. However, the paper itself concerns the Deep Red Sequence of the third fossil horizon

in the Lower Lufeng Formation. Most likely, these are unequivalent and should be corrected." Thereupon, C.C. Young, in his fossil section, arranged these several taxa in the third fossil horizon (Deep Red Sequence) and second fossil horizon (upper section of the Dark Purple Sequence). This text believes that because there is only one authentic record, reference must be made to it solely. This text also believes that the fossils should have been produced from the Deep Red Sequence based on the location of the Dadi Fossil site. Simmons misplaced the productive horizons of both Dadi and Heiguopeng (1965, Table 2).

5. Phytosauria

Currently there is only one genus and species recorded (C.C. Young, 1951) of the incomplete *Pachysuchus imperfectus*. The material is fragmentary and it is not possible to conduct any further conclusions. The specimen was produced from the Deep Red Sequence.

6. Protosuchia.

The material of C.C. Young's (1951) *Microchampsa scutata* consists of a portion of torso and a section of vertebrae encircled by dermal armor. There is no skull. Simmons' material consists of a similar arrangement of bone, also without a skull. Within the past several years, the authors of this text have collected a small individual from the Deep Red Sequence that possesses a skull as well as articulated post crania. The specimen displays dermal armor similar to *Microchampsa scutata* and is very possibly the same taxa. Preparation and study are currently being undertaken.

Dianosuchus (C.C. Young, 1982) is a separate genus of Protosuchian found by Guihai Cui in the Deep Red Sequence at Zhangjiawa. How this taxa relates to the other Protosuchians awaits further studies.

7. Saurischia

The only breakthrough within the past 30 years regarding the Lufeng saurschian dinosaurs of Yunnan has been in Wuding County, where genuine Sauropods have been excavated from such localities as Yongran. Stratigraphic correlation of the fossil deposits indicates that it should correlate to the Lower Lufeng Formation. Xijin Zhao agrees that the Lower Lufeng Formation belongs to the Early Jurassic based on the presence of Sauropods. C.C. Young opposed this concept on the basis of the non presence of Sauropods in the Lufeng Basin itself. As the authors' current work has not extended to regions outside of the Lufeng Basin, the controversy of the presence of sauropod dinosaurs cannot be addressed.

The coelurosaur, *Lukuosaurus*; the carnosaur, *Sinosaurus*; and the prosauropod genera *Lufengosaurus, Yunnanosaurus*, and *Gyposaurus* are recorded from both the Deep Red and Dark Purple Sequences. C.C. Young (1951) described a material that was derived entirely from the Dark Purple Sequence of Dachong and Shawan. Simmons' (1965) material was derived from the Deep Red Sequence of Dadi and Heiguopeng.

8. Ornithischia

Discoveries of Ornithischian dinosaurs constitute important progress within the Lufeng Saurischian fauna. Simmons (1965) distinguished an ornithopod mandible amidst the material collected by Oehler which he designated *Tatisaurus*. C.C. Young described two Ornithischians in 1982: *Tawasaurus* and *Dianchongosaurus*. The former is represented by two small skulls in the Geological Museum that were collected by Chengzhi Hu in 1957. Initially they were considered to belong to the Rhynchocephalia and were designated *Lufengoscphalus*. This condition resembles that of *Neotrilophosaurus* described earlier, however, a manuscript was completed and submitted

for publication. As these circumstances occurred when the "Handbook of Chinese Vertebrate Fossils" was being compiled, and the editors were accumulating data as rapidly as possible prior to its impending publication, this nomenclature was included in the Handbook. Subsequently, reevaluation of these fossils was undertaken by the original worker, corrections were made, and the specimens were renamed *Tawasaurus* and assigned to the Ornithischia. Therefore, the nomenclature *Lufengocephalus tawae* referred to in the Handbook should be abandoned. The Rhyncocephalia are currently still unrecorded from the Lower Lufeng Formation.

Despite these circumstances, Jiming Dong (pers. comm.) is skeptical about whether *Tawasaurus* is a genuine Ornithischian. The reasons are due to the tooth row extending to the anterior extremity of the mandible where a separate predentary is also absent. Perhaps this form is related to a hitherto unknown small saurischian. As the *Dianchongosaurus* material is too restricted, it is not possible to conduct any further conclusions.

9. Lacertilia

Fulengia youngi, studied and published by Carrol and Galton in 1977, is currently the only member of the Lacertilia represented from the collections of the Lufeng Basin. It displays the fundamental structure and appearance of modern lacertilians. The specimen was collected from the Deep Red Sequence of Dadi.

10. Therapsida

Nearly all the Therapsida are represented by the Tritylodontoidea, with the exception of *Kunminia*.

There are currently a total of five genera and eight species of tritylodonts known, among which are *Bienotherium* with four species and the remainder each represented by a single genus and species. According to the current material, aside from the tritylodontid, *Bienotherium*, collected by Chengzhi Hu of the Geological Museum in 1959 (Chow, 1962) from the Deep Red Sequence, the remaining three genera are produced from the Dark Purple Sequence (Young, 1947). Excluding *Bienotherium magnum* and *Oligokyphus* (Young, 1974), the taxa are for the most part small tritylodontids; *Yunnania* (Cui, 1976), *Dianzhongia* (Cui, 1981), and *Lufengia* (Chow and Hu, 1959), have average skull lengths of 4 5 cm and exhibit abundant discrepancies. However, until recently *B. magnum* and *Oligokyphus* were represented by single specimens. The *B. magnum* specimen was collected from Heiguopeng as was the *Lufengia* specimen described by Chow and Hu (1959). The current relationship between the two in the *Lufengia* paper is not clear. The stratigraphic horizon that produced the specimens is not mentioned and the locality is described only as being a large depression at Heiguopeng, with the age being Late Triassic. Table 1 from C.C. Young's 1982 paper places the *Lufengia* localities and stratigraphic position all in the Deep Red Sequence of the Lower Lufeng Formation at Heguopeng, Dawa, and Dachong. It is believed here that these taxa are probably distributed throughout both the Deep Red and Dark Purple Sequences based upon these fossil localities. In summary, deeper research is required to classify these small trytylodontids, for only then will it be possible to draw reliable conclusions. Hopson and Kitching (1972) expressed doubt regarding the possibility of a small *Bienotherium* being *Lufengia* and questioned whether the Dachong specimen was also possibly a small individual of *Bienotherium*.

According to the literature, *Kunminia* (Young, 1947) is a small animal genuinely worthy of attention as it bears an intimate relationship to the origin of mammals. It is currently not possible to advance the understanding of this animal as the specimen's whereabouts is unclear and there are no new indications concerning it.

11. The earliest mammals

These are distinctly the most significant small animals in the assemblage. The known material is not sparse and for the most part consists of small skulls and comparatively small limb elements. Current knowledge indicates the entire collection to be from the Deep Red Sequence, or more accurately from Strata Layer 8 of Table 4. Clarification is required regarding the paper by Patterson and Olson (1961) in which the stratigraphic position for *Sinoconodon rigneyi* was recorded as approaching the upper section of the Dark Purple Sequence. The distance of C.C. Young's (1982) second fossil horizon from the Dark Purple Sequence boundary at Dadi is 30 meters and at Huiguopeng is 100 meters. Due to this, C.C. Young documented the occurrence of *Sinoconodon rigneyi* and *Morganucodon oehleri* both in the Dark Purple Sequence (Young, 1982). Currently, it is the authors' consideration that the situation should be dealt with in the same manner as the Simmons' specimens previously mentioned, and henceforth be placed in the Deep Red Sequence.

Six taxa of these earliest mammals have been recorded from the Lufeng Basin collections, all of which have been placed among four genera. Among these are *Morganucodon* (Rigney, 1963) and *Eozostrodon* (Young, 1978; Zhang and Cui, 1983) which should be synonymized. However, since different workers insist on employing incongruous nomenclature, a concensus has yet been reached. *Lufengoconodon* (Young, 1982) has been reevaluated by Crompton and Ailin Sun (in press), who believe that this skull should also be reassigned to *Sinoconodon*, the prior nomenclature should be eventually abandoned, but temporarily retained. In this manner, there are two genera conserved: the unique Chinese *Sinoconodon* and the contemporaneous extensively distributed *Morganucodon*. Whether or not the four species of *Sinoconodon* can be maintained is also dependent upon the reevaluation of the specimens.

The entire fauna of the Lower Lufeng Formation from the Lufeng Basin is presented in Table 5.

Discussion

Late Triassic to Early Jurassic vertebrate bearing fossil deposits are extensively distributed in North America. Units such as the eastern region's Newark Group and the western region's Chinle system have formerly been considered Upper Triassic with their upper units possibly representing the Rhaetic (Reeside et al., 1957). In recent years, research combining palynological, potassium argon, and ichnological data (Olson and Galton, 1977) have suggested that the chronology for the Newark Group Zone 3 should enter the Early Jurassic, and that Zone 2 correlates generally to the Rhaetic. Pollen studies also indicate the western region's Chinle Formation to be equivalent to the Middle Keuper. Overlying the Chinle are the important bone bearing deposits of the Glen Canyon Group which Olson and Galton (1977) considered to correlate to the Newark Group Zone 3 based upon ichnological and pollen data. Of particular significance is the large collection of material collected from Arizona's Kayenta Formation, which includes saurischian and ornithischian dinosaurs, protosuchians, tritylodontids, turtles, lacertillians, pterosaurs, amphibians, and early mammals (Jenkins et al., 1983). Attridge, Crompton, and Jenkins (1985) summarized the fauna and concluded its age to be Early Jurassic.

Whether the upper section of the South African Stormberg Series belongs to the Rhaetic or Liassic is also in a state of controversey. Olson and Galton (1977) believed the Newark fauna Zone 3 to be its equivalent, based upon the possibility that the tritylodontids and earliest mammals of Europe were Jurassic, and the absence of standard Triassic animals such as the phytosaurs, pseduosuchians, and labyrinthodont amphibians. A current issue of the Society of Vertebrate Paleontology News Bulletin reports Olson and Galton as developing a new opinion that the Rhaetic

and Liassic boundary may be demarcated within the Elliot Fm. of the Stormberg Series. A formal paper is in press.

The total thickness of the Dark Purple Sequence of the Lower Lufeng Formation in the Lufeng Basin is approximately 550 meters. According to C.C. Young (1982), the major fossil bearing unit lies 200 meters above the basal boundary, and 30 and 100 meters below a 20 meter thick massive green sandstone (see Table 2). Although the vertical distribution of fossils is relatively widespread, the taxonomic diversity at this horizon is low, with the principle elements consisting of prosauropods and *Bienotherium*. To the contrary, the fossils from the Deep Red Sequence are produced 70 meters above a "massive green sandstone," such as unit 8 of Table 4, and the diversity is much greater. Several important "new archetypes" are found in this horizon, such as primitive mammals, crocodiles, and ornithischian dinosaurs. A current problem lies the presence of many species of pseudosuchians that are found in this horizon, whereas the underlying Dark Purple Sequence has yet to produce any of these taxa.

Obviously, the reason for the comparatively low taxonomic diversity from the Dark Purple Sequence may be due to a prior collecting bias. This text, however provisionally agrees that faunas produced from the Dark Purple Sequence and Deep Red Sequence may be characterized separately.

Table 5 illustrates many taxa from the Deep Red Sequence that may be extended into the Jurassic. These include the tritylodontids, mammals, protosuchids, and ornithischians. The prosauropods may additionally enter the Jurassic (Olson and Galton, 1977) as well as the labyrinthodont amphibians, of which Jurassic records exist (Warren, 1977). However, the Pseudosuchia and Phytosauria do not extend their range past the Triassic and these two groups are not represented in the Kayenta Formation.

If these two families were not present in the Deep Red Sequence of the Lower Lufeng Formation, there would be an obvious correlation to the Kayenta Formation and the region could be confidently assigned to the Liassic. The phytosaur previously mentioned consists only of the single genus and species *Pachysuchus imperfectus*, the specimens of which is not adequate and requires reevaluation. However, the pseudosuchian data is represented by a good number of taxa which provokes complications toward chronological comprehension. It may be that the Deep Red Sequence falls into the Rhaetic, or it may be that it extends into the Liassic, if one reasons that the Pseudosuchians along with the labyrinthodont amphibians surpass the Triassic boundary and enter the Jurassic. In actuality, the Lufeng pseudosuchians are not comparable to the earlier Aetosauridae or Prestosuchidae and the significantly derived Ornithosuchidea and Sphenosuchidae co-occur with the Protosuchidae while sharing basic morphology. Olson and Galton (1977) considers the Spenosuchidae as crocodillomorphs.

The stratigraphic distribution of the Oehler collection was based on the work of Meinian Bian. Simmons later made a general assignment of the pseudosuchians in the collection to the Deep Red Sequence. There is a distinct possibility that these pseudosuchians were all collected from the strata underlying the Deep Red Sequence, such as from Strata Level 7 of Table 4, the deposit from which the authors collected the most recent pseudosuchian specimen. If this is the situation, then it may be possible to draw the Rhaeto Liassic boundary between Strata Levels 7 and 8 of Table 4. This opinion was also suggested by Xijin Zhao upon the conclusion of his Lufeng work in 1966 and 1967. However, Zhao himself has currently reevaluated his position and now advocates the entire Lufeng Formation be assigned to the Liassic (pers. comm.)

With regard to the Deep Red Sequence, the authors are currently inclined to promote the chronologic assignment of the vertebrates from unit 8 of Table 4 to the Liassic. With the clarification of the Dark Purple Sequence's fossil occurrences and the Deep Red Sequence's

pseudosuchians, the age assignment of the entire Lower Lufeng Formation will be relatively easier to solve.

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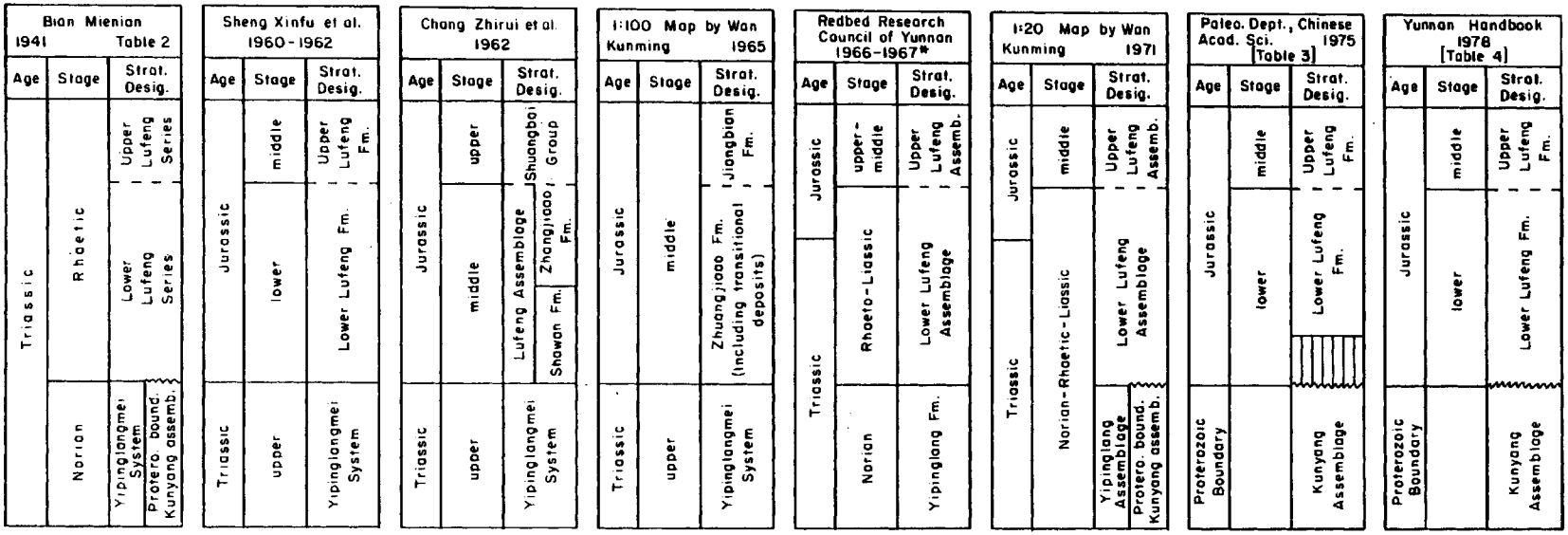
Table I: A Chronicle of the Lower Lufeng Time Divisions in the Lufeng Region



*Preliminary conclusions of fieldwork (in Yunnan) regarding Mesozoic redbeds as arranged in a table for the Institute of Vertebrate Paleontology, Paleoanthropology Academia Sinica

Table 5. Fossil vertebrates of the Lower Lufeng Fm. from the Lufeng Basin

Stratigraphic position*	Taxon	Locality	Note***
Deep red Sequence	Amphibia		
	Labyrinthodontia indet. Sun, 1962	Heiguopeng	
	Reptilia		
	Chelonia indet.	Zhangjiawa	
	Pseudosuchia		
	Platyognathus shuii Young, 1944	Dahuangtien	
	Dibothrosuchus elaphros Simmons, 1965	Dadi	
	Strigosuchus licinus Simmons, 1965	Dadi	
	Pseudosuchia indet.	Dadi	
	Phytosauria		
	Pachysuchus imperfectus Young, 1951	Dahuangtien	Table 4, unit 8
	Protosuchia		
	Microchampsa scutata Young, 1951	Dahuangtien	Table 4, unit 8
	Dianosuchus chanchiawaensis, Young, 1982	Zhangjiawa	Table 4, unit 8
	Prosauropoda		
	Gyposaurus sinensis Young, 1941	Dahuangtien	
	Yunnanosaurus huangi Young, 1941	Dahuangtien	
	Y. robustus Young, 1941	Dahuangtien, Erzuan Mt.	
	Lufengosaurus huenei Young, 1941	Dahuangtien	
	L. magnus Young, 1941	Dahuangtien, Erzuan Mt.	
	Coelurosauria		
	Lukosaurus yini Young, 1948	Dahuangtien	
	Carnosauria		
	Sinosaurus triassicus Young, 1948	Dahuangtien, Erzuan Mt.	
	Ornithischia		
	Tatisaurus oehleri Simmons, 1965	Dadi	
	Tawasaurus minor Young, 1982	Heiguopeng	
	Dianchongosaurus lufengensis Young, 1982	Zhangjiawa	
	Lacertilia		
	Fulengia youngi Carroll and Galton, 1977	Dadi	

Table 5 Cont.

Deep Red Sequence	Therapsida		
	Lufengia delicata Chow and Hu, 1959	Heiguopeng	
	Yunnania brevirostre Cui, 1976	Zhangjiawa, Shiliangzi	Table 4, unit 8
	Dianzhongia longirostrata Cui, 1981	Zhangjiawa, Shiliangzi	Table 4, unit 8
	Oligokyphus sinensis Young, 1974	Dahuangtien	
	Bienotherium magnum Chow, 1962	Heguopeng	
	Kuminia minima Young, 1947	Zhangjiawa	
	Mammalia		
	Morganucodon oehleri Rigney, 1963	Heiguopeng**	
	Eozostrodon hekuopengensis Young, 1978	Heguopeng	Table 4, unit 8
	Sinoconodon rigneyi Olson and Patterson, 1961	Heiguopeng	Table 4, unit 8
	S. parringtoni Young, 1982	Zhangjiawa, Shiliangzi	Table 4, unit 8
	S. changchiawaensis Young, 1982	Zhangjiawa, Shiliangzi	Table 4, unit 8
	S. yangi Zhang and Cui, 1983	Dahuangtien	Table 4, unit 8
Dark Purple Sequence	?Protorosauria		
	Dianosaurus petilus Young, 1982	Dachong	
	Prosauropoda		
	Gyposaurus sinensis Young, 1941	Shawan	
	Yunnanosaurus huangi Young, 1941	Shawan, Dachong	
	Y. robustus Young, 1941	Dachong	
	Lufengosaurus huenei Young, 1941	Shawan, Dachong	
	L. magnus Young, 1941	Shawan, Dachong	
	Coelurosauria		
	Lukosaurus yini Young, 1948	Shawan	
	Carnosauria		
	Sinosaurus triassicus Young, 1948	Dachong, Shawan	
	Therapsida		
	Bienotherium yunnanensis Young, 1940	Dachong, Shawan	
	B. elegans Young, 1947	Dachong, Shawan	
	B. minor Young, 1947	Dachong	

*Based on the stratigraphic subdivision of Table 3.

**The locality and stratigraphic position is not known in detail but is reported to be close to the *Sinoconodon* locality and may possibly be the same locality. *Morganucodon* and *Eozostrodn* are synonomous but the latter nomenclature is provisionally retained.

***It is currently possible to correlate this unit with these taxa.