TETRAPOD FAUNA OF THE UPPER TRIASSIC (REVUELTIAN)
OWL ROCK FORMATION, CHINLE GROUP, ARIZONA

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Abstract—The Owl Rock Formation, upper Chinle Group, crops out in the Four Corners area. In the 1980s, Kirby made an extensive collection of vertebrate fossils from the Owl Rock Formation in the Ward Terrace area, northeastern Arizona. We review the Owl Rock tetrapod fauna and refine the taxonomic assignments provided by previous workers. The Owl Rock Formation tetrapod assemblage thus consists of: metoposaurid amphibians, including the centra of cf. Buettneria sp. and Apachesaurus sp.; sphenodontids; kuhneosaurids; various indeterminate procolophonids, archosauromorphs and archosaurs; a variety of suchian reptiles, including cf. Postosuchus, Postosuchus sp., cf. Poposaurus sp. and shuvosaurids; the aetosaur Typothorax coccinarum; male and female morphs of the phytosaur Pseudopalatus buceros; and a coelophysoid. The presence of P. buceros and T. coccinarum in the fauna confirm the age of the Owl Rock fossil assemblage as Revueltian.

INTRODUCTION

The Owl Rock Formation is part of the upper portion of the Upper Triassic Chinle Group that crops out in northern Arizona, southern Utah and northwestern New Mexico. The tetrapod fauna of the Owl Rock Formation is considerable, but has never been formally published, except in very preliminary form (Kirby, 1989, 1991, 1993), as descriptions of singular taxa (Murry and Kirby, 2002; Fraser et al., 2005; Butler et al., 2006) or in larger review papers (Long and Murry, 1995; Heckert et al., 2005). In addition, these previous works (Kirby’s in particular) are in serious need of updating, given the considerable changes in the taxonomy of Late Triassic tetrapods that have taken place since their publication (e.g., Long and Murry, 1995 and ensuing commentary in the literature). The tetrapod fossils discussed here are from localities along Ward Terrace, in the southwest portion of the Navajo Nation Indian Reservation, northeastern Arizona (Fig. 1). These localities provide the principal tetrapod fauna from the Owl Rock Formation. Here, we review previous studies conducted on the Owl Rock tetrapod fauna, provide our own analysis of the fauna and summarize the differences between the interpretation of previous workers and our own. In this paper, MNA refers to the Museum of Northern Arizona, Flagstaff.

PREVIOUS STUDIES

The history of modern study of the tetrapods from the Owl Rock Formation in Arizona is rather brief, due primarily to the majority of previous information deriving from a single worker, Randy E. Kirby. In two short papers (Kirby, 1989, 1993) and an extensive, unpublished master’s thesis, Kirby (1991) provided the basis for our study. Later workers began to revise the fauna first documented by Kirby (1991), but only in piecemeal fashion (e.g., Murry and Kirby, 2002; Butler et al., 2002).

Kirby (1989) provided a preliminary summary of the Ward Terrace collecting area, regional stratigraphy, a depositional model and a faunal list. This faunal list included hybodontid sharks; palaeoniscid, colobodontid and coelacanthid fishes; metoposaurid amphibians; sphenodontid?, poposaurid? and sphenosuchian reptiles; the aetosaur Typothorax; two taxa of phytosaurs; and theropod and fabrosaurid dinosaurs. Kirby’s (1991) thesis provided an expanded discussion of all the material that he listed previously. This thesis was more focused on the vertebrate fauna, presenting the taxonomy of all the specimens from the Owl Rock Formation in the MNA collection, as well as justification of his taxonomic assignments. This remains the only taxonomic discussion of the fauna. Kirby (1993) summarized the Late Triassic basin evolution of the Chinle Group depositional system and discussed faunal replace-
ment events in light of this model. He also provided an updated faunal list for the Owl Rock Formation, further revised from Kirby (1991).

Relatively few studies have examined Owl Rock tetrapods since Kirby (1993). Murry and Kirby (2002) described a new genus and species of hybodont shark, Reticulodus synerus, from the Owl Rock Formation based on various isolated lateral teeth collected by Kirby during his thesis work. Reticulodus is also known from older specimens from stratigraphically lower strata in the Petrified Forest National Park collected by Murry (Murry and Kirby, 2002). Fraser et al. (2005) described a leptopleurine procolophonid, from the unit in the Abajo Mountains of southeastern Utah, based on an incomplete skull; this is the only tetrapod record from the Owl Rock Formation outside of Arizona.

Heckert (2001) briefly re-evaluated some of the putative prosauropod or ornithischian dinosaurs from Kirby’s collection. This served as the basis for comparison with an unusual archosauriform tooth from Switzerland that is similar to the Owl Rock form, illustrated by Butler et al. (2006). Heckert et al. (2005) noted that the fauna documented by Kirby (1991) is indicative of a Revuelian age.

**SYSTEMATIC PALEONTOLOGY**

**AMPHIBIA**

**TEMNOSPONDYLI**

**METOPOSAURIDAE**

Metoposauridae indet.

Kirby (1991) assigned all amphibian material recovered from the Owl Rock Formation at Ward Terrace to cf. *Metoposaurus* sp. This material consists of cranial elements, pectoral girdle elements and various vertebral centra. Much of the material that Kirby (1991) referred to cf. *Metoposaurus* consists of isolated cranial fragments bearing the prominent “waffle-iron” sculpturing that is found on the skull and pectoral girdles of this family of Late Triassic amphibians (Hunt, 1993). Unfortunately, these cranial fragments do not include the lacrimal, a vital bone in order to discriminate genera and species within the Metoposauridae (Hunt, 1993). Thus, all material that we do not discuss separately below is considered Metoposauridae indet.; without the morphology of the lacrimal we cannot provide any finer taxonomic evaluation.

**cf. Buettneria**

MNA V1508 is a set of three relatively large centra (Fig. 2A-F). These centra are discoidal and pertain to a non-*Apachesaurus* metoposaur, most probably *Buettneria* (Hunt, 1993).

**Apachesaurus sp.**

MNA V5575 is a pair of small, elongate centra (Fig. 2G-L). This elongation of the centra is characteristic of *Apachesaurus* (Hunt, 1993). Thus, these specimens can be confidently assigned to *Apachesaurus* sp.

**LEPIDOSAURIA**

**SPHENODONTIA**

**SPHENODONTIDAE**

Sphenodontidae indet.

An isolated partial dentary (MNA V7056), an incomplete premaxilla? (MNA V7057) and six jaw fragments (MNA V7058-7063) were identified by Kirby (1991) as belonging to sphenodontids. Kirby (1991) found all eight of these specimens generally similar to *Clevosaurus hudsoni*, and he referred to them as “*Glevosaurus* [sic].” Harris et al. (1999) included these specimens in a preliminary analysis of sphenodontian diversity in the Chinle Group, but did not discuss them in detail. All specimens exhibit acrodont tooth implantation, hence Kirby’s (1991) interpretation of them as sphenodontian, but they are all fragmentary – few preserve more than one reasonably complete tooth, and none are obviously referable to a known genus.

**KUHNEOSAURIDAE**

Kuhneosauridae indet.

Kirby (1993, fig. 2) listed abundant kuhneosaurid specimens from a single locality (MNA locality 360) in the Owl Rock Formation. However, specimens of this taxon are not discussed or noted in Kirby (1991)

and were not found during our examination of the MNA collection. As such, there is no discussion, description or photographic documentation of these specimens. Thus, we include them for the sake of completeness but cannot corroborate Kirby’s (1993) identification.

**ARCHOSAUROMORPHA**

**Archosauromorpha indet.**

Kirby (1993, fig. 2) listed, but did not discuss or illustrate, specimens that he referred to as Ornithischia? indet. from a single locality (MNA locality 853). Some of these were illustrated by Kirby (1991) in his master’s thesis. Heckert (2001) described these teeth, noting that they have characteristics of both ornithischians and prosauropods, but are not definitively assignable to either taxon. Butler et al. (2006) demonstrated that at least some of the teeth described by Kirby (1991) are similar to a putative heterodontosaurid from the Upper Triassic of Switzerland that is not referable to Ornithischia and should instead be considered Archosauriformes incertae sedis.

During our examination of the MNA collection, we encountered a proximal limb fragment that was labeled as a femur of a Ornithischia? (Fig. 3L-P). This element is very rectangular in proximal view, with a ridge running down the posterior side of the shaft and a rectangular groove along the anterior side of the shaft. When comparing this supposed femur to femora of other basal ornithischians, we noted numerous differences, for example, the femoral head is not twisted as in ornithischians, the shaft is straight not bowed and there is no indication of a fourth trochanter (compare Fig. 3L-P with Norman et al., 2004, fig. 14.5a). Thus, we interpret this element as not pertaining to an ornithischian; and given its rectangular proximal end and straight shaft, we interpret the element as a fibula, not a femur. However, as a fibula it is rather non-descript, so we only identify it as an archosauromorph fibula.

tered two bone fragments, cataloged together, that were identified as Staurikosaurus indet. (Fig. 3A-H). These appear to be limb elements, with one fragment (Fig. 3A-D) potentially being a distal tibia, given the offset of two surfaces on one end of the fragment (Fig. 3C). The other fragment appears to be a limb element given its elliptical cross-section, but cannot be interpreted further (Fig. 3E-H). Staurikosaurus (Colbert, 1970) is, of course, widely considered a junior subjective synonym of Herrerasauridae (Reig, 1963) (e.g., Langer, 2004). However, given Kirby’s (1993) lack of justification for his interpretation and the poor quality of the specimens we assign them to Archosauromorpha indet.

**RHYNCHOSAURIA**

**cf. Rhynchosauridae?**

Kirby (1993) includes **cf. Rhynchosauridae?** in his faunal list of the Owl Rock, but did not discuss, describe or provide specimen numbers for this material. During on examination of the MNA collection, we were not able to identify any material assigned to cf. Rhynchosauridae?, thus, for the sake of completeness, we tentatively include this taxon in our revised faunal list, but cannot corroborate Kirby’s (1993) identification of this material.

**TRILOPHOSAURIDAE**

“T. buettneri”

Kirby (1991) assigned an isolated incomplete tooth (MNA V7064), five posterior mandible fragments (MNA V7065-7069), two fragmentary condyle condyles (MNA V7070-7071) and 82 quadratocondyles from bulk samples (MNA V7072-7074) to **Trilophosaurus** cf. **T. buettneri**. Heckert et al. (2006) and Spielmann et al. (2007) considered the isolated tooth to either belong to a procolophonid with similar tooth morphology (e.g., Tricauisaurus) or to be screenwashed contamination from previous workers, and thus an unsubstantiated record of Trilophosaurus. This interpretation is supported by the fact that this is the only record of Trilophosaurus from strata younger than mid-Rxuvelian and would also be the only Revuelitan occurrence of T. buettneri, which has a current biostratigraphic range that extends from mid-Otischalkian to mid-Adamanian (Spielmann et al., 2007). The other cranial material tentatively assigned to **Trilophosaurus** cf. **T. buettneri** includes undiagnostic fragments that, while sharing some features with T. buettneri, exhibit the following differences “[the lower jaw] possesses a comparatively deeper ventral border, more constricted cotylus, shallower adductor fossa, and less well-developed retroarticular process. The condyle likewise exhibits greater constriction, and a more cotylus, shallower adductor fossa, and less well-developed retroarticular process. The condyle likewise exhibits greater constriction, and a more cotylus, shallower adductor fossa, and less well-developed retroarticular process. The condyle likewise exhibits greater constriction, and a more...” (Kirby, 1991, p. 246). The only feature that Kirby (1991) noted as a similarity between this material and T. buettneri is the quadrate condyle lacking a distinctive external pit. This does not provide a convincing argument to assign this material to **Trilophosaurus buettneri**, though, because there are more differences between this material and T. buettneri than similarities. Thus, there is no substantiated record of **Trilophosaurus buettneri** from the Owl Rock Formation. We refer the isolated tooth (MNA V7064) to Procolophonidae indet. and the mandible and quadratocondyle (MNA V7065-7069 and MNA 7070-7074, respectively) to Archosauromorpha indet.

**ARCHOSAURIA**

Archosauria indet.

MNA V5616 and V5617 are distal femora that Kirby (1991) identified as **Postosuchus** sp. However, the U-shaped groove between the distal condyles indicates that these specimens pertain to either a theropod dinosaur or to a shuvosaurid archosaur, both of which have very similar distal femora. The lack of the crista tibiofibularis makes it difficult to assign these specimens to either group confidently, so we consider them Archosauria indet.

MNA V6731 is a series of three incomplete sacral centra that Kirby (1991) assigned to cf. **Postosuchus** sp. (Fig. 4A-B). Two of the three centra are fused, but, because of their poor preservation, that is all that can be distinguished about them. Three or more fused centra are found in rauisuchians (e.g., **Postosuchus** and theropod dinosaurs (e.g., Coelophysis). With no additional characteristics to distinguish these specimens we refer them to Archosauromorpha indet.

**SUCHIA**

**cf. Postosuchus** sp.

An extensive list of incomplete cranial and postcranial elements was given by Kirby (1991) as pertaining to **Postosuchus** sp., including numerous elements that can now be assigned to various other related taxa given improvements in rauisuchian taxonomy since Kirby’s evaluation (Long and Murry, 1995; Nesbitt and Norell, 2005; Lucas et al., 2007). Any specimens assigned by Kirby (1991) to this taxon that are not discussed elsewhere we still identify as **Postosuchus** sp.

**Postosuchus** sp.

One specimen, a proximal left tibia fragment (MNA V5604), assigned to **Postosuchus** sp. by Kirby (1991), is identical to the proximal tibia of **Postosuchus kirkpatricki** (Fig. 4U-Y). The proximal articulation of MNA V5604 has a triangular posterior half and a rectangular anterior half, just as in P. kirkpatricki (compare Fig 4U with Chatterjee, 1985, fig. 1B). However, the morphology of the tibia is not diagnostic of P. kirkpatricki, as interpreted by Chatterjee (1985) or Long and Murry (1995). So, given the close similarity but non-diagnostic nature of this specimen, we tentatively assign it to **Postosuchus** sp.

**cf. Poposaurus** sp.

Kirby (1991) identified a distal tibia (MNA V5605) as belonging to **Postosuchus** sp. (Fig. 4R-T), but this specimen clearly demonstrates a posterior distal condyle that is well below the level of the anterior distal condyle. This feature is present in **Postosuchus**, **Poposaurus** and **Shuvosaurus**, but it is more prominent in **Poposaurus**, as in MNA V5605, so we identify this specimen as **Poposaurus** sp.

**SHUVOSAURIDAE**

**Shuvosauridae** indet.

We note that there is no diagnosis of Shuvosauridae that currently encompasses all the specimens assigned to this family, so we use it provisionally to refer to the family of suchian reptiles that include Shuvosaurus (=Effigia) and Sillosuchus (Group X of Nesbitt, 2007). In addition, we follow Lucas et al. (2007) in considering Shuvosaurus to be the senior subjective synonym of Effigia and recognize that the genus Shuvosaurus has two species, S. inexpectatus and S. okeeffeae.

Two proximal tibia fragments (MNA V5602 and MNA V5603) that Kirby (1991) originally identified as **Postosuchus** sp. are interpreted here as being the proximal tibia of a shuvosaurid (Fig. 4L-N, Z-DD). The tibiae are subtriangular in proximal view with a proximal groove that overhangs the posterior margin. Overall, the specimens bear a resemblance to S. okeeffeae (compare Fig. 4L-N, Z-DD to Nesbitt, 2007, fig. 45), but because the MNA specimens are not identical to S. okeeffeae, the Owl Rock specimen having a more D-shaped proximal end and lacking a prominent ridge on its lateral surface, thus, we refer this material to Shuvosauridae indet. Indeed, Nesbitt (2007, p. 80) listed shuvosaurid (his Group X) specimens, including tibiae, from the same locality as MNA V5602 and V5603, but he did not provide specimen numbers or additional information.

MNA V5615 is a nearly complete right femur in two fragments (Fig. 4F-K). Kirby (1991) initially identified this specimen as **Postosuchus** sp. Kirby, based on the fibular groove opening at a nearly 90° angle and presence of a fibular condyle that is subangular, we assign this specimen to Shuvosauridae indet. (following Parker and Irmis, 2005).
Kirby (1991) assigned numerous osteoderms, a thoracic rib, an incomplete centrum and an incomplete astragalus to the aetosaur *Typothorax coccinarum* based on the osteoderm morphology. Given the slightly arched nature of the paramedian osteoderms and their random, densely pitted ornamentation with prominent transverse ventral keels, along with the dorsoventrally compressed lateral osteoderms (Fig. 5) that are acutely folded into a laterally directed point, we concur. These specimens clearly pertain to *T. coccinarum* and not to *T. antiquum* (Lucas et al., 2002) or to any of the known species of *Redondasuchus* (Hunt and Lucas, 1991; Heckert et al., 1996; Spielmann et al., 2006). These specimens are important in that they corroborate a Revueltian age for the Owl Rock Formation, as first indicated by Lucas (1993; Lucas and Hunt, 1993).
Kirby (1991) identified MNA V4763 as a vertebra of cf. _Postosuchus_ sp. However, the vertebra is extremely waisted, giving it an hourglass-shape in ventral view, and it lacks the prominent ventral lips on the anterior and posterior articular surfaces of the centra that are seen in _Postosuchus_ (compare Fig. 4C-E to Long and Murry, 1995, fig. 130). This morphology more closely resembles an anterior caudal vertebra of a phytosaur than it does _Postosuchus_, so we assign this specimen to Parasuchidae indet.

**Pseudopalatus buceros**

As noted by Kirby (1991, p. 291), phytosaurs are the “dominant component of [the] Ward Terrace vertebrate fauna...at all localities.” All of the phytosaur fossils were assigned to either _Pseudopalatus pristinus_, _Pseudopalatus_ cf. _P. buceros_ or cf. _Pseudopalatus_? sp. by Kirby (1991). We reassign all the phytosaur material from the Ward Terrace localities that is identifiable to the specific level to _Pseudopalatus buceros_. In addition, Kirby (1991) found evidence for five individuals based on cranial material; we revise this assessment, counting at least six individuals from the Ward Terrace sample.

Kirby (1991) identified most of the phytosaur cranial material he examined as _P. pristinus_, with the exception of a complete skull with a rostral crest (MNA V3478) that he identified as _Pseudopalatus_ cf. _P. buceros_. Providing no detailed diagnosis for either _P. buceros_ or _P. pristinus_, Kirby (1991) simply assigned phytosaur skulls lacking a rostral crest to _P. pristinus_ and the one skull possessing a rostral crest (MNA V3478) to _Pseudopalatus_ cf. _P. buceros_. The unassociated phytosaur postcrania were assigned to cf. _Pseudopalatus_? sp.

Curiously, a few of the specimens that Kirby (1991) assigned to _P. pristinus_ do not have the rostral portion of their skull preserved. For example, MNA V3478, which is not included in Kirby’s (1991) list of referred specimens, is a large, incomplete phytosaur skull preserving much of the skull posterior to the anterior margin of the antorbital fenestra (Fig. 6B-C). Unfortunately, the rostral portion of the skull anterior to the antorbital fenestra is not preserved. This is also the case with MNA V1983, listed as _P. pristinus_ in Kirby’s (1991) referred specimens; it is the left posterior portion of a skull, and nothing anterior to the nares is preserved (Fig. 7). Again, in MNA V1595, a large fragment of the left posterior portion of the skull, nothing anterior to the orbit is preserved (Fig. 8B).

While a variety of diagnoses exist in the literature for _Pseudopalatus_ (Ballew, 1989; Kirby, 1991; Long and Murry, 1995; Hungerbühler, 2002; Zeigler et al., 2002), the features that are generally agreed upon as diagnostic of the genus are: squamosal bars are usually prominently sculptured; suprtemporal fenestra are short and narrow in dorsal view with narrow anterior margins; medial expansion of the squamosal bar narrows the transverse diameter of the supratemporal fenestrae; external nares are even with or raised above the level of skull roof; squamosal compressed with no rounded posterior process; suprtemporal fenestra partially concealed in dorsal view; no fully crested rostrum; dentition weakly heterodont to homodont; and anterior end of snout is downturned with a constriction just posterior to the anterior margin. All the phytosaur skulls from the Owl Rock Formation clearly possess characteristics of _Pseudopalatus_.

Zeigler et al. (2002, 2003) posited sexual dimorphism in _Pseudopalatus_ based on the prominent rostral crest of some specimens being a sexual display device. As explicitly stated by Zeigler et al. (2002, 2003) in their abstracts (though not in the text), the implication of their study is that _Pseudopalatus pristinus_, the “species” lacking the rostral crest, is the probable female morph, and _P. buceros_, possessing a prominent rostral crest, is the likely male morph. Thus, these two species should be synonymized into a single, sexually dimorphic species. Given that _P. buceros_ (Cope, 1881) has priority over _P. pristinus_ (Mehl, 1928), the result is that _P. pristinus_ becomes a junior subjective synonym of _P. buceros_. Thus, all of the phytosaur material from the Owl Rock Formation is assigned to _P. buceros_, with one male skull (MNA V3478) (Fig. 6A), one female skull (MNA V3495) (Fig. 8C-F) and four skulls that are too incomplete to assign to either gender with confidence (MNA V1595, V1983, V3478, V3498) (Figs. 6B-C, 7, 8A-B). This follows figure captions for MNA V3478 and V3495 in Heckert et al. (2005), in which they also identify the skulls as male and female morphs, respectively, of _P. buceros_. The six skulls listed above are represented by distinct elements, most notably the posterior left portion of the skulls, so each represents a single individual. This differs from Kirby’s (1991) assessment, which identified only five individuals based on cranial elements, although MNA V3478 is not listed in Kirby’s referred specimens, so there is no evidence he saw or was aware of this specimen.

Kirby (1991) briefly described a collection of phytosaur postcrania from the Owl Rock Formation. Most of the specimens in this collection consist of various limb elements (Figs. 9C-F, 11), including paired femora (Fig. 11), as well as some lower jaws (Fig. 6D-E), girdle elements (Figs. 9A-B,10), vertebrae and dermal armor. Phytosaur taxonomy is based almost exclusively on cranial characters (Long and Murry, 1995; Hungerbühler, 2002), so isolated or associated postcrania are rarely assigned to a generic or specific level (but see Camp, 1930; Hunt, 1994). However, given that only _Pseudopalatus buceros_ skulls were collected from the Owl Rock localities, we assign the postcrania to _Pseudopalatus buceros_ based on their association with more diagnostic material. _Pseudopalatus buceros_ is an index taxon of the Revueltian LVF, and is known from older Revueltian strata (e.g., Painted Desert Member of the Petrified Forest Formation) and cements a Revueltian age for the Owl Rock fauna.

**Sphenosuchia indet.**

Kirby (1991) illustrated and described vertebral centra and isolated teeth that he assigned to sphenosuchidae indet. During our examination of the MNA collection, we did not find, and thus could not examine these centra. However, based on the illustrations of Kirby (1991) these centra do appear waisted as are sphenosuchian centra. Thus, we
FIGURE 10. Reconstructed right pelvis of *Pseudopalatus buceros*, consisting of MNA V7903, right pubis, MNA V7904, right ischium and MNA V1602, right ilium.

consider this record legitimate. The teeth Kirby (1991) assigned as sphenosuchid are mediolaterally compressed and recurved, but this is a common feature of basal theropods, as well as suchian reptiles, thus these teeth should be considered Archosauromorpha indet.

**DINOSAURIA**
**THEROPODA**
**Coelophysoidea indet.**

A single proximal right femur (MNA V7240) in the MNA collection was labeled as *Coelophysis* sp. (Fig. 31-K). This specimen is discussed by Kirby (1991) as Ceratosauria?, and Kirby (1993) records putative theropod specimens from the Owl Rock Formation. The femur has a “hooked” femoral head and a prominent trochanteric shelf, characteristic of the Coelophysoidea. However, the specimen also appears pathologic, given the fine, pustulose bone texture on the trochanteric shelf that is not seen in other coelophysoid specimens and obscures the fine morphology of this feature. Thus, given our inability to further discern this specimen’s morphology we assign it to Coelophysoidea indet.

**DISCUSSION**

Our revision of the Owl Rock tetrapod fauna from the Ward Terrace area provides an update to the previous interpretations of Kirby. As summarized in Table 1, several taxa have been split into additional taxa, some of which were not previously recognized from the Owl Rock Formation, while a few have been collapsed congruent with current taxonomic thinking and nomenclature (e.g., *Pseudopalatus*). The revised Owl Rock fauna list confirms the Revuelitan age of the assemblage advocated previously (e.g., Heckert et al., 2005). Thus, the presence of *Pseudopalatus* and *Typothorax coccinarum*, two index taxa of the Revuelitan LVF, justify recognition of the Owl Rock tetrapod assemblage as the stratigraphically highest, and thus youngest, Revuelitan assemblage in Arizona. Given that the Owl Rock Formation clearly overlies the Black Forest Bed in Petrified Forest National Park (e.g., Heckert and Lucas, 2002) and that the Black Forest Bed has been dated as less than 214 Ma (perhaps as young as 211 Ma) (Riggs et al., 2003), this indicates that the Revuelitan extended from well before 214 Ma until well after 210 Ma, because Owl Rock deposition clearly took place over several million years (Tanner, 2000; Tanner and Lucas, 2007).

**ACKNOWLEDGMENTS**

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TABLE 1. Comparison of the Owl Rock fauna as reported by Kirby (1993) and the revised faunal list advocated here, with principal taxonomic changes noted.

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<thead>
<tr>
<th>Faunal list of Kirby (1993)</th>
<th>Principal taxonomic changes</th>
<th>Revised faunal list</th>
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<td><strong>Amphibia</strong></td>
<td>cf. Metoposaurus sp. A</td>
<td>Metoposaurus indet.</td>
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<td>Metoposauridae</td>
<td>cf. Metoposaurus sp. B</td>
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<td>cf. Metoposaurus sp. A</td>
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<td>Shuvosauridae indet.</td>
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