Chapter 20
Re-Assessment of Late Campanian (Kirtlandian) Turtles from the Upper Cretaceous Fruitland and Kirtland Formations, San Juan Basin, New Mexico, USA

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Abstract The fossil turtles from the Upper Cretaceous Fruitland and Kirtland formations (late Campanian; Kirtlandian) have been known for more than 100 years. We re-assess and revise these Late Cretaceous testudine taxa from the San Juan Basin, New Mexico, USA, and discuss their biostratigraphic distribution. We recognize the following valid taxa as present: the bothremydid *Chedighaii hutchisoni*; the pleurosternid *Compsemys* sp.; the baenodds *Denazinemys nodosa* and *Scabremys* gen. nov., established for the distinct species *S. ornata*, previously included in *Denazinemys*; and *Boremys grandis*, though it is a rare taxon. The non-baenodd baenid *Neurankylus baueri* is recognized as a valid species. Two additional non-baenodd baenid taxa, *Thescelus hemispherica* and *T. rapiens*, are retained as distinct species and are not considered synonymous with *T. insiliens*. We also recognize a small indeterminate kinosternoid similar to that reported from the Campanian of Mexico. The two adocids *Adocus bossi* and *A. kirtlandius* are retained as distinct species. The nanhsiungchelyid *Basilemys gaffneyi* sp. nov. is established, whereas *Basilemys nobilis* is considered a nomen dubium because it lacks the diagnostic features that would allow referral to any known valid species. We recognize three trionychids: *Aspideretoides austerus* and *A. robustus* (new combination), and an unnamed plastominine. We synomize *Aspideretoides fontanus* and *A. vorax* with *A. austerus*. *Aspideretoides ovatus* is considered a subadult of *A. robustus*. The unnamed plastominine may represent a new genus and species. Turtles of the Fruitland-Kirtland formations resemble other late Campanian turtle assemblages from western North America, and are part of the characteristic vertebrate fauna of the Kirtlandian land-vertebrate age. The upper Fruitland and lower Kirtland formations (Hunter Wash local fauna) have greater turtle taxonomic diversity than the upper Kirtland Formation (Willow Wash local fauna). This apparent decrease in taxonomic diversity is interpreted as being real and reflects a shift in depositional (channel) environments to a more terrestrial one, a pattern which is seen in other North American Late Cretaceous settings.

Keywords Fruitland Formation • Kirkland Formation • Late Cretaceous • Late Campanian • San Juan Basin • New Mexico

Introduction

Fossil turtles have been known from the Fruitland and Kirtland formations, San Juan Basin, New Mexico, USA, for more than 100 years. Oliver Perry Hay was the first to name testudine taxa from these Upper Cretaceous strata (Hay 1908, 1910), and Charles W. Gilmore was the first to critically assess the species of fossil turtles from the Fruitland and Kirtland formations in a subsequent series of papers (Gilmore 1916, 1919, 1935). Wiman (1933) also published a paper on these and other fossil turtles from the Upper Cretaceous and Paleocene strata of the San Juan Basin, based on a collection at the University of Uppsala, Sweden, that was purchased through the private collector Charles H. Sternberg.

Few detailed studies on Fruitland-Kirtland turtles have been published since. Armstrong-Ziegler (1978) listed turtle taxa and later (Armstrong-Ziegler 1980) reported on a few fragmentary specimens in the collections of the Museum of Northern Arizona, Flagstaff. Mateer (1981) reviewed the Kirtland Formation turtles, and other "mega reptiles," from

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the Uppsala collection, originally described in a series of papers by Wiman (1930, 1931, 1932, 1933). Lucas (1981) and Hunt and Lucas (1992) briefly mentioned the turtles from the Fruitland and Kirtland formations and provided a list of taxa. This was followed by a summary of New Mexico Cretaceous vertebrates, where they again listed turtles from both the Fruitland and Kirtland formations (Hunt and Lucas 1993). Most recently, McCord (1996) provided a cursory assessment of Late Cretaceous through early Eocene turtles from the San Juan Basin based on a small collection amassed by the University of Arizona, Laboratory of Paleontology, Tucson. That collection has since been transferred to the New Mexico Museum of Natural History and Science, Albuquerque.

Since the 1970s, collecting efforts in the Fruitland and Kirtland formations in the San Juan Basin resulted in the recovery of more than 400 turtle specimens to date (early 2010); over 200 catalogued specimens are in each of the collections of the New Mexico Museum of Natural History and Science (Albuquerque) and the State Museum of Pennsylvania (Harrisburg). These turtle specimens range from fragmentary carapace and plastron material to nearly complete shells. Some limb, girdle, and vertebral material has been recovered together with some isolated mandibular remains. No shells with articulated axial and appendicular skeletons have been recovered from Cretaceous or Paleocene deposits of the San Juan Basin.

Here, we document all the known turtle taxa from the upper Fruitland and Kirtland formations and assess their biostratigraphic occurrences in light of this increased sample size. We list all known (as of 2010) previously referred, and newly referred, turtle specimens from these two formations in Appendix .

Institutional abbreviations used in this chapter are: AMNH, American Museum of Natural History, New York, New York, USA; CMN, Canadian Museum of Nature, Ottawa, Ontario, Canada; FMNH, Field Museum of Natural History, Chicago, Illinois, USA; KUVP, University of Kansas, Lawrence, Kansas, USA; LSUMG, Louisiana State University, Museum of Natural Sciences, Baton Rouge, Louisiana, USA; MNA, Museum of Northern Arizona, Flagstaff, Arizona, USA; NMMNH, New Mexico Museum of Natural History, Albuquerque, New Mexico, USA; PMU, Paleontologiska Museet, Uppsala, Sweden; ROM, Royal Ontario Museum, Toronto, Ontario, Canada; SECCP, Secretaria de Educacion y Cultura, Coleccion Paleontologica, Coahuila, Mexico; SMP, The State Museum of Pennsylvania, Harrisburg, Pennsylvania, USA; TMM, Texas Memorial Museum, Austin, Texas, USA; TTU, Texas Tech University Museum, Lubbock Texas, USA; UALP, University of Arizona, Tucson, Arizona, USA; USNM, National Museum of Natural History, Smithsonian Institution, Washington, D. C., USA.

Systematic Paleontology

Testudines Linnaeus 1758
Pleurodira Cope 1865
Bothremydidae Baur 1891
Chedighaii Gaffney et al. 2006
Chedighaii hutchisoni Gaffney et al. 2006

Holotype: KUVP 14765, skull.

Holotype locality, **unit**, **and age**: KUVP loc. #35, NW¼, SW¼, Sec. 34, T24N, R13W, San Juan County, New Mexico; Hunter Wash Member, Kirtland Formation; late Campanian (early Kirtlandian).

Remarks: Gaffney et al. (2006) named and described *Chedighaii hutchisoni* for a nearly complete skull from the lower Kirtland Formation (Hunter Wash Member). No shell (carapace and plastron) material has been identified as *Chedighaii hutchisoni*, although some fragments (e.g., of a xiphiplastron) of "*Naiadochelys*" *ingravata* Hay (1908), presumably from the Chaco Canyon region, may pertain to this species (Gaffney et al. 2006).

Cryptodira Cope 1868
Paracryptodira Gaffney 1975
Pleurosternidae Cope 1868
Compsemys Leidy 1856
Compsemys sp.
(Fig. 20.1)

Referred specimens: See Appendix for complete list of referred specimens.

Occurrence: Within the San Juan Basin, New Mexico, known from upper part of Fruitland Formation and throughout the Kirtland Formation; late Campanian (Kirtlandian). See "Remarks", below, for occurrences outside of San Juan Basin.

Remarks: Armstrong-Ziegler (1978) listed *Compsemys* sp. as present in the Fruitland Formation without comment, and later she referred a carapace fragment (MNA Pl. 1648) to this genus based on its "closely set, flat-topped pustulae" sculpturing (Armstrong-Ziegler 1980, p. 16). McCord (1996) also recognized *Compsemys* from the Fruitland and Kirtland formations based on two fragmentary specimens (UALP 14391 and UALP 14393, now NMMNH P-49819 and P-49827, respectively). Only a single specimen from the Fruitland Formation in the collections of the NMMNH and SMP has been identified as *Compsemys* sp., NMMNH P-22741. However, 15 specimens of *Compsemys* sp. have been recovered from the Kirtland Formation (see Appendix), most of which are from the upper part (De-na-zin Member).

Specimens identified here as *Compsemys* sp. all bear the purported distinctive sculpturing, consisting of fine tubercles, some of which are co-joined to form short sinuous strands. SMP VP-1892, a peripheral, clearly shows this

Fig. 20.1 *Compsemys* sp. SMP VP-1892, peripheral, in dorsal view. Bar scale = 1 cm

sculpturing (Fig. 20.1). We note, however, that the sculpturing of *Compsemys* is very similar, if not identical, to stem plastominines, and that the two taxa cannot be easily be separated on that feature alone (see below).

Compsemys victa Leidy 1856, known primarily from the Paleocene of North America, has also been identified in the Upper Cretaceous (late Maastrichtian; Lancian) Laramie Formation of Colorado (Hutchison and Holroyd 2003). We are unable to assign any of the Fruitland and Kirtland material to this species due to their incomplete nature. *Compsemys* sp. has also been identified from the Smoky Hollow Member of the Straight Cliffs Formation (late Turronian) of Utah (Eaton et al. 1999), and is known from various Campanian–Maastrichtian age units in the North American Western Interior.

Baenidae Cope 1882
Baenodda Gaffney and Meylan 1988
Denazinemys Lucas and Sullivan 2006
Denazinemys nodosa (Gilmore 1916)
(Fig. 20.2)

Holotype: USNM 8345 (Fig. 20.2a, b), nearly complete carapace and plastron.

Holotype locality, **unit**, **and age**: Locality 60 of Bauer (1916), two miles northwest of Ojo Alamo store (= Willow Wash), San Juan County, New Mexico; De-na-zin Member, Kirtland Formation; late Campanian (late Kirtlandian).

Referred specimens: See Appendix for complete list of referred specimens.

Occurrence: San Juan Basin, New Mexico; Hunter Wash and De-na-zin members, Kirtland Formation; late Campanian (Kirtlandian).

Revised diagnosis: Differs from *Scabremys ornata* (Gilmore 1935) (see below) by the following features: carapace sub-triangular with widest dimension posteriorly; prepleurals present and contacting the first vertebral medially; first vertebral irregular hexagonal shape with greatest width posteriorly, contacting anterior second vertebral; extracervicals lateral to primary cervical, gular sub-divided; and carapace nodes irregular and not forming distinct anteroposteriorly-directed ridges.

Remarks: Lucas and Sullivan (2006) reviewed specimens attributed to the form-genus "*Baena*", including both species "*B.*" *nodosa* and "*B.*" *ornata*. *Denazinemys* is known primarily from the Late Cretaceous of New Mexico, but has been reported as far south as Big Bend, Texas (Tomlinson 1997), suggesting that *Denazinemys* was restricted to the southern part of the Western Interior (Lucas and Sullivan 2006). It should be noted that the specimens designated as cf. *Denazinemys* (= "*Baena*") *nodosa*, from the Campanian lower and upper shale members of the Aguja Formation, are too incomplete for species recognition (contra Tomlinson 1997), and assignment to other baenids could be made in the absence of other characters (see below).

We regard these two turtles, *Denazinemys nodosa* and *Scabremys* (= *Denazinemys*, in part) *ornata*, as distinct genera and species (see below). We note that many of the incomplete specimens do not exhibit the suite of characters that would permit identification to the genus level. Typically, only the node-like sculpturing of the carapace is seen on incomplete, isolated material, so even reference to genus based on carapace fragments is not at all certain.

The holotype of *Denazinemys nodosa* (USNM 8345) is from the De-na-zin Member (upper Kirtland Formation), whereas the holotype of *Scabremys ornata* (USNM 13229) is from the Hunter Wash Member (lower Kirtland Formation). The fragmentary material (carapace fragments) referred to *D. nodosa* cannot be referred to this species because of its incomplete nature, contrary to Lucas and Sullivan (2006). See the Appendix for revised list of specimens referred to *D. nodosa*.

Scabremys gen. nov.

Synonymies: *Baena*: Leidy 1870 [in part]. "*Baena*": Gaffney 1972 [in part]. *Denazinemys*: Lucas and Sullivan 2006 [in part].

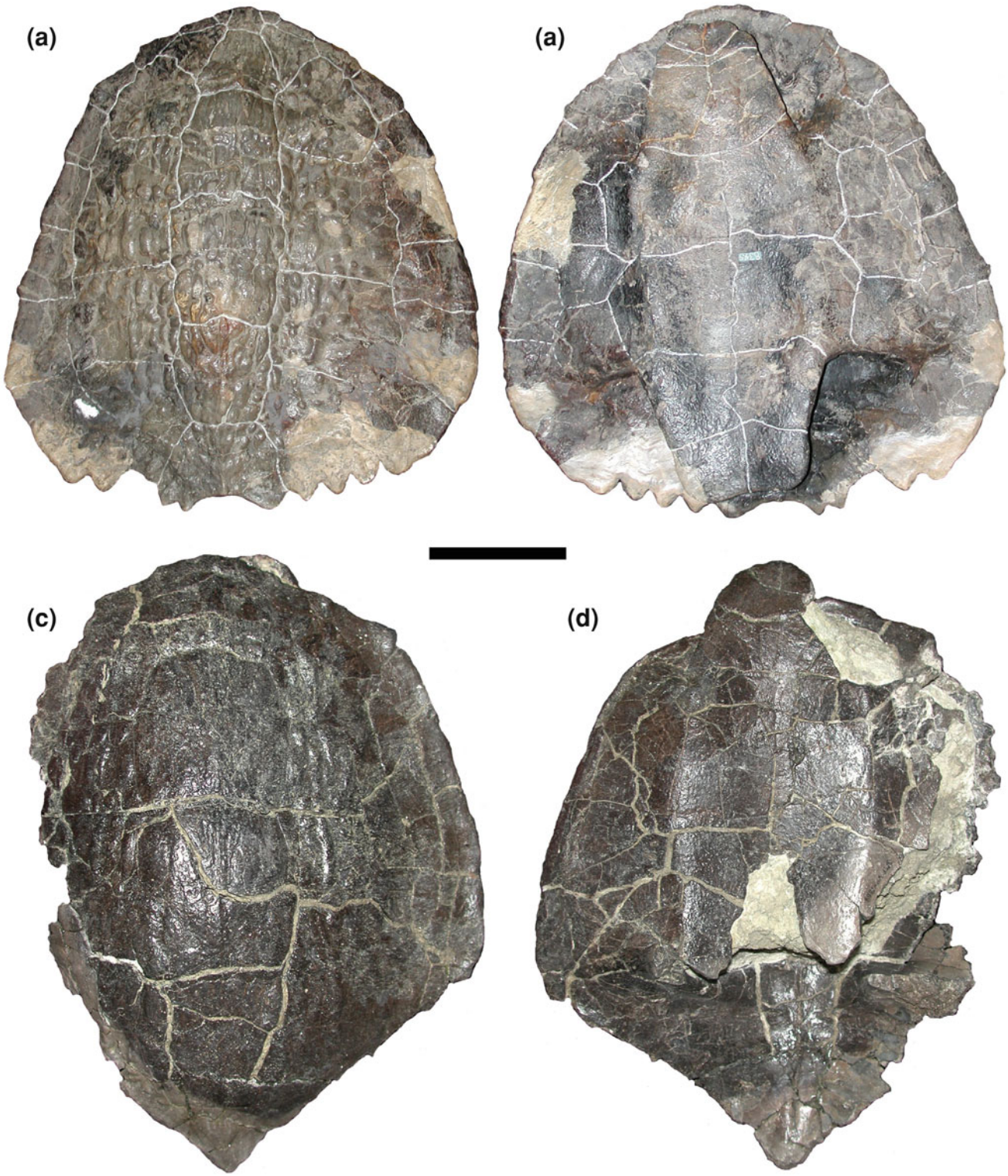


Fig. 20.2 *Denazinemys nodosa* (Gilmore 1916). **a**, **b** USNM 8345 (holotype), nearly complete carapace and plastron: **a** carapace, in dorsal view; **b** plastron, in ventral view. **c**, **d** SMP VP-1869: **c** carapace, in dorsal view; **d** plastron, in ventral view. Bar scale = 10 cm

Type species: *Scabremys ornata* (Gilmore 1935).

Etymology: From the Latin stem "scabr" meaning rough, in reference to its unusually rough, nodular sculpturing on the carapace; and from the Greek "emys," meaning turtle.

Occurrence: San Juan Basin, New Mexico; Hunter Wash Member, Kirtland Formation; late Campanian (early Kirtlandian).

Diagnosis: Same as for species.

Remarks: *Denazinemys* is considered a monotypic taxon based on a set of apomorphic characters cited above. Previous inclusion of the species *D. ornata* in *Denazinemys* was largely a result of it previously being placed with "*Baena*" based on having nodose sculpturing on the external surface of the carapace. However, nodose sculpturing is rather widespread among baenids, and is present, in various degrees, on the carapaces of the type species of *Denazinemys*, *Boremys* Lambe 1906, and *Thescelus* Hay 1908. The holotype of *D. ornata* has a number of unique characters that exclude it from the genus *Denazinemys* and other baenodd taxa.

Scabremys ornata (Gilmore 1935) new combination.
(Fig. 20.3)

Synonymies: *Baena ornata*: Gilmore 1935, p. 165, Figs. 7, 8. "*Baena*" *ornata* (Gilmore): Gaffney 1972, pp. 302–303. *Denazinemys ornata* (Gilmore): Lucas and Sullivan 2006, pp. 226–227, Fig. 3.

Holotype: USNM 13229 (Fig. 20.3), nearly complete carapace and plastron.

Holotype locality, **unit**, **and age**: Three miles northeast of Hunter's Store (Bisti Post Office), SW ¼, T 24N, R13W, San Juan County, New Mexico; Hunter Wash Member, Kirtland Formation; late Campanian (early Kirtlandian).

Referred specimens: None.

Revised diagnosis: Differs from *Denazinemys nodosa* by the following features: carapace oval, with widest dimension midway along carapace; prominent midline ridge formed by three or four raised ridges, separated by narrow grooves, that extend for nearly the entire length of the carapace; no prepleurals; first vertebral irregular hexagonal shape with greatest width anteriorly, contacting the cervical and both first marginals; extracervicals absent, and gulars not subdivided.

Remarks: Gilmore (1935) established the taxon *Baena ornata* based on USNM 13229 (Fig. 20.3), a nearly complete carapace and plastron, from the Hunter Wash Member of the Kirtland Formation. The description and observations made by Gilmore (1935) are mostly sound and need not be repeated here in their entirety. Suffice it to say there are some features that need to be emphasized and are noted here with their corresponding additional character number (characters 137–142) added to those of Joyce (2007).

The shape of the shell of *Scabremys ornata* is significantly different from that of *Denazinemys nodosa* in that it retains the more primitive rounded/oval shape and has its widest part midway, rather than at the posterior part of the carapace (character 137). The posterior scalloping of the carapace is less prominent and more restricted compared to *D. nodosa*. The external nodose surface texture in this taxon is extreme, and is far greater than that of *D. nodosa*. Unlike *D. nodosa*, the nodes are more elongated and ridge-like with a prominent compound ridge running along the midline juxtaposed with the neurals (character 138), which we score as a derived character. The anterior section of the carapace lacks prepleurals (character 139), which are prominently present in *D. nodosa* and *Boremys*. The anterior margin of vertebral 1 (character 140) is widest (primitive) in *Neurankylus* Lambe 1902, *Trinitichelys* Gaffney 1972, *Plesiobaena* Gaffney 1972, and *Scabremys*; the opposite condition (shortest) is seen in the other taxa. The presence of extracervicals (character 141) is seen only in *D. nodosa*, *Baena arenosa* Leidy 1870, and *Chisternon undatum* (Leidy 1872) and is a derived feature that is absent in all other baenids. *S. ornata* is the only baenid taxon without subdivided gulars (character 142), which also is a derived feature.

Using the data matrix of Joyce (2007) we extracted the baenids (*Neurankylus eximius* Lambe 1902, *Trinitichelys hiatti* Gaffney 1972, *Plesiobaena antiqua* (Lambe 1902), *Boremys pulchra* (Lambe 1906), *Chisternon undatum*, *Baena arenosa*, and *Denazinemys nodosa*), added a hypothectical ancestor together with *Scabremys ornata*, and scored all nine taxa for six additional characters cited above. We ran a phylogenetic analysis using PAUP 4.0b10 (Swofford 2002). Our data matrix, which did not include skull characters, was subjected to a heuristic search with 1000 replicates. All characters were unordered and unweighted. The best tree length obtained was 81, with a consistency index of 0.9506, and a retention index of 0.8095. It placed *Scabremys ornata* as the sister taxon to (*Boremys pulchra* [*Chisternon undatum* (*Baena arenosa* + *Denazinemys nodosa*)]). The strict consensus tree of three trees grouped the taxa as (*Plesiobaena antiqua* [*Scabremys ornata* (*Boremys pulchra* [*Chisternon undatum* (*Baena arenosa* + *Denazinemys nodosa*)])]) with the hypothetical ancestor, *Neurankylus eximius*, and *Trinitichelys hiatti* forming a basal polytomy (Fig. 20.4). Our interpretation that *Scabremys ornata* is clearly distinct from *Denazemys nodosa* and other baenodd turtles is supported by this analysis.

Lucas and Sullivan (2006) re-evaluated the holotype of *Scabremys* ("*Baena*") *ornata* (USNM 13229) from the lower Kirtland Formation (Hunter Wash Member), and placed it in the new genus *Denazinemys*. No other specimens have been referred to this species from New Mexico.

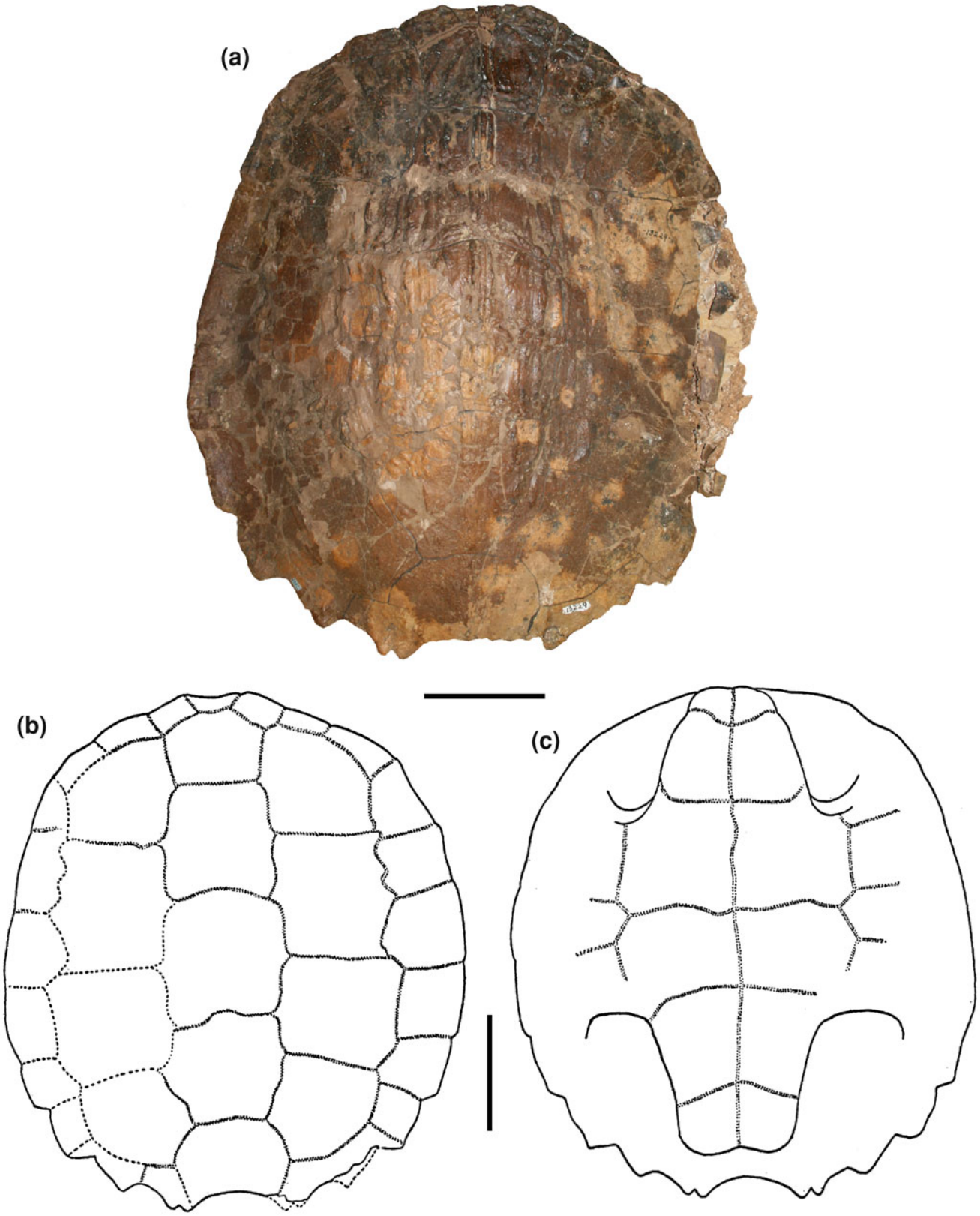


Fig. 20.3 *Scabremys* gen. nov., *S. ornata* (Gilmore 1935); USNM 13229 (holotype), nearly complete carapace and plastron. **a** Photograph of carapace, in dorsal view; **b**, **c** *line* illustrations, from Gilmore (1935): **b** carapace, in dorsal view; **c** plastron, in ventral view. Photograph and drawings at different magnifications; bar scales = 10 cm

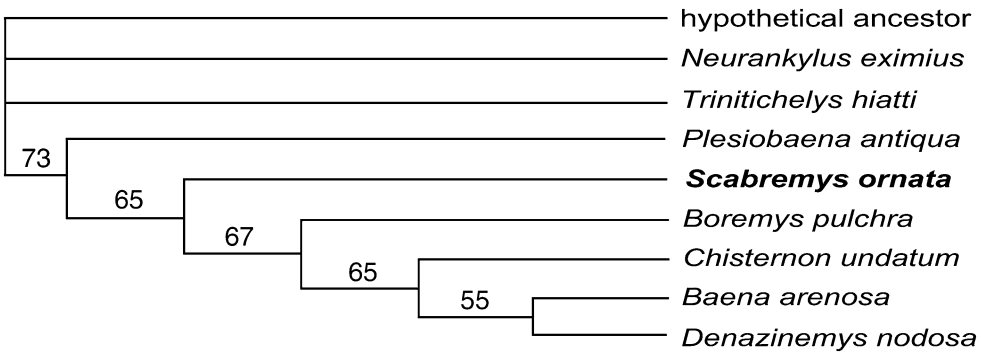


Fig. 20.4 A strict concensus tree of three trees for the Baenidae, showing the phylogenetic position of *Scabremys ornata*. Bootstrap values are indicated *above lines*. Data matrix extracted from Joyce (2007), with six additional characters (see text)

However, one specimen (LSUMG V-1136), consisting of a nearly complete carapace and reportedly from the "lower part of the Paleocene Black Peaks Formation," southwest of Sombrero Peak, was identified as "*Baena*" cf. "*B.*" *ornata* by Tomlinson (1997). We note here that the rocks of the lower part of the Black Peaks Formation are now considered Maastrichtian age and not Paleocene in age (Fowler 2009, personal communication). This age is consistent with the fact that LSUMG V-1136 co-occurs with *Hoplochelys* Hay 1908, a taxon which, in New Mexico, is present in the early Maastrichtian Naashoibito Member, Ojo Alamo Formation (Lehman 1981; Jasinski et al. 2011). However, no specimens of *Scabremys* (= "*Denazinemys*") *ornata* are presently known from either the De-na-zin Member (Kirtland Formation) or the Naashoibito Member (Ojo Alamo Formation). Based on the illustration of Tomlinson (1997, p. 37, Fig. 3.7), LSUMG V-1136 would seem to have features that are referable to both *D. nodosa* (presence of prepleurals) and *S. ornata* (oval shape of carapace). We therefore regard this specimen as an indeterminate baenid (see below). For now *Scabremys ornata* is known only from the holotype (USNM 13229, Fig. 20.3) and is restricted to the lower part of the Kirtland Formation (Hunter Wash Member).

Boremys Lambe 1906
Boremys grandis Gilmore 1935
(Fig. 20.5)

Synonymies: *Boremys grandis*: Gilmore 1935, p. 170. *Boremys pulchra*: Lambe 1906 [in part], p. 189. *Boremys pulchra* (Lambe 1906): Gaffney 1972 [in part] p. 296.

Holotype: USNM 12979, nearly complete carapace (Fig. 20.5a) and plastron.

Holotype locality, **unit**, **and age**: Three miles northeast of Hunter's Store (Bisti Post Office), SW ¼, T 24N, R13W, San Juan County, New Mexico; Hunter Wash Member, Kirtland Formation; late Campanian (early Kirtlandian).

Referred specimens: See Appendix for complete list of referred specimens.

Occurrence: San Juan Basin, New Mexico; Hunter Wash Member, Kirtland Formation; late Campanian (early Kirtlandian).

Remarks: Lambe (1906) named *Boremys pulchra* from the Dinosaur Park Formation (Brinkman 2005) based on an incomplete carapace and plastron. Gaffney (1972), in his review of the Baenidae, synonymized *Boremys grandis* Gilmore 1935 with *B. pulchra*. However, he also noted that the supermarginal scutes seen in both the holotype (USNM 12979, Fig. 20.5a) and PMU.R16 (Fig. 20.5b = Ex. 9 of Wiman 1933, p. 11) may be a reason to consider it a valid species, though he considered this doubtful based on limited evidence. In a subsequent chapter, Brinkman and Nicholls (1991) recognized *B. grandis* as a distinct species based on: (1) the proliferation of supramarginal scales and (2) its large size. They also tentatively considered the arrangement of cervical scales to be a unique feature of *B. grandis*, because that is not seen in any specimens of *B. pulchra* (Brinkman and Nicholls 1991).

SMP VP-1565 (Fig. 20.5c) is tentatively referred to *Boremys grandis* based on a small plastral fragment consisting of a section of the right gular and epiplastron. If large size is a valid distinguishing character, then on that basis assignment to *B. grandis* is all but certain as it is consistent with the size of the holotype specimen (USNM 12979). *Boremys pulchra* is half the size of *B. grandis* (Gilmore 1935; Brinkman and Nicholls 1991). Aside from the holotype, and the Uppsala specimen (PMU.R16), this is the only other specimen that is referable to *B. grandis*, making it an extremely rare species. The holotype and the referred specimens are all from the lower Kirtland Formation (Hunter Wash Member).

Incertae sedis
Neurankylus Lambe 1902
Neurankylus baueri Gilmore 1916
(Fig. 20.6)

Synonymies: *Neurankylus baueri*: Gilmore 1916, p. 290. *Neurankylus eximius*: Lambe 1902 [in part]; Gaffney 1972, p. 291.

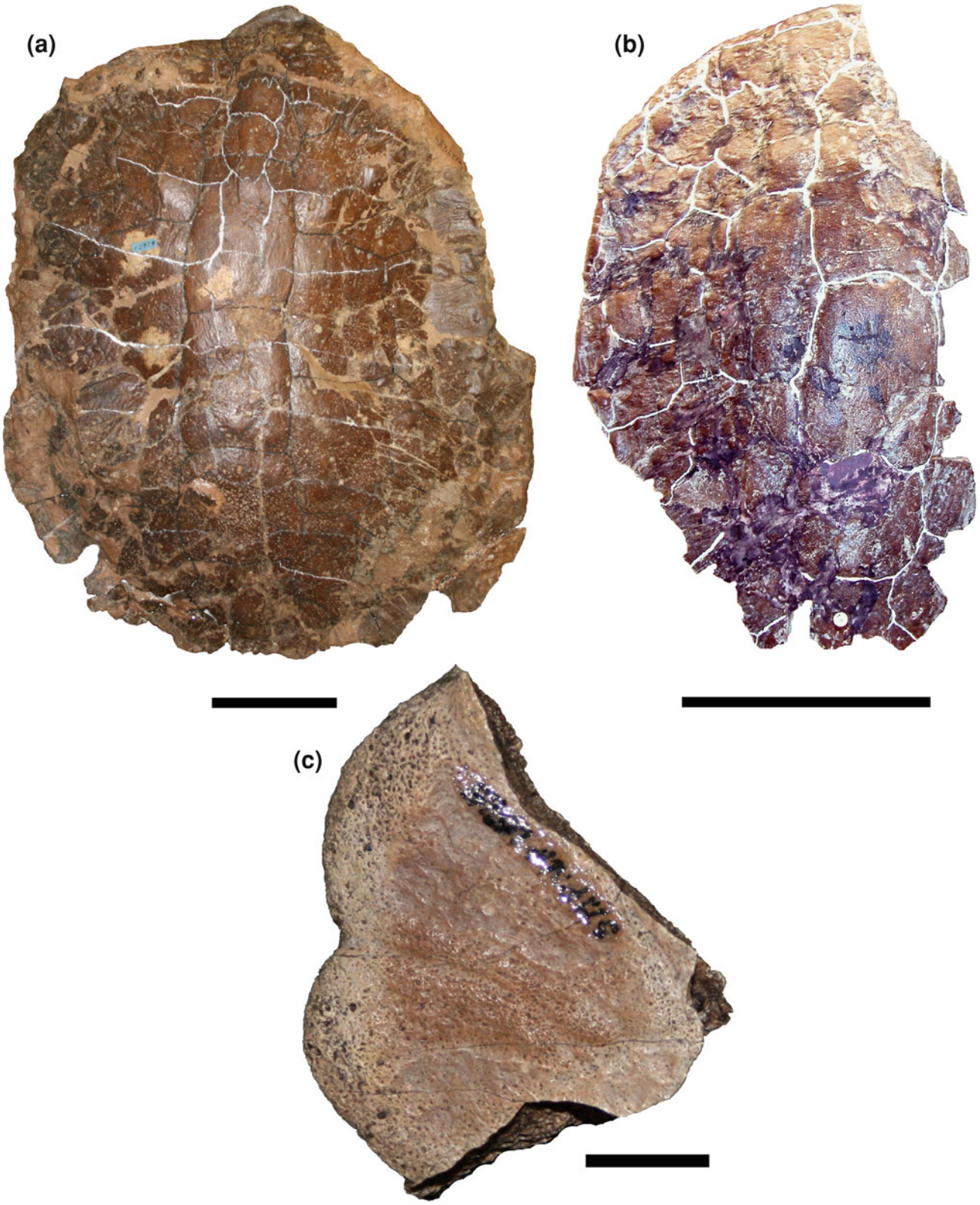


Fig. 20.5 *Boremys* specimens. **a**, **b** *Boremys grandis* Gilmore 1935: **a** USNM 12979 (holotype), nearly complete carapace and plastron, carapace only, in dorsal view; **b** PMU.R16, incomplete carapace, in dorsal view. **c** cf. *Boremys* sp., SMP VP-1565, right gular and epiplastron fragment, in ventral view. Specimens at different magnifications; bar scales = 1 cm

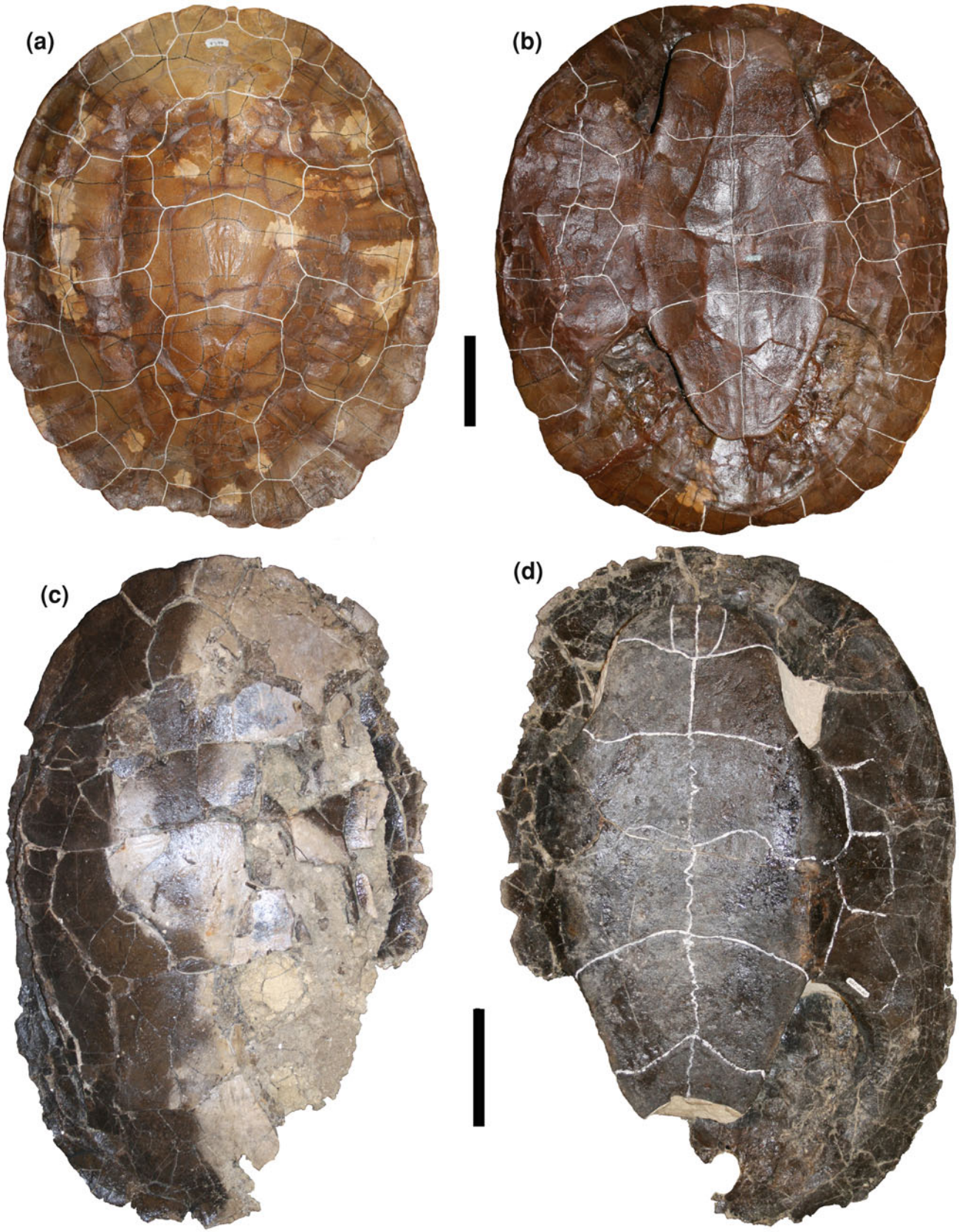


Fig. 20.6 *Neurankylus baueri* Gilmore 1916. **a**, **b** USNM 8344 (holotype), nearly complete carapace and plastron: **a** carapace, in dorsal view; **b** plastron, in ventral view. **c**, **d** SMP VP-2379, nearly complete carapace and plastron: **c** carapace, in dorsal view; **d** plastron, in ventral view. Specimens at different magnifications; bar scales = 10 cm

Holotype: USNM 8344 (Fig. 20.6a, b), nearly complete carapace and plastron.

Holotype locality, **unit**, **and age**: Ah-shi-sle-pah Wash (= Meyers Creek), middle branch, San Juan County, New Mexico; Hunter Wash Member, Kirtland Formation; late Campanian (Kirtlandian).

Referred specimens: See Appendix for complete list of referred specimens.

Occurrence: San Juan Basin, New Mexico; Hunter Wash and De-na-zin members, Kirtland Formation; late Campanian (Kirtlandian).

Revised diagnosis: Differs from all other species of *Neurankylus* in having the following combination of characters: gulars well-developed and deep; intergulars U-shaped and in contact with humerals posteriorly (thereby excluding the gulars from contact across the midline).

Remarks: Gilmore (1916) established the species *Neurankylus baueri* based on USNM 8344 (Fig. 20.6a, b), which is a complete carapace and plastron, from the Hunter Wash Member of the Kirtland Formation. He stated that it differed from the holotype of *N. eximius* (CMN 1504) in the number of costals (8 vs. 9), but noted that Hay (1908) considered this feature to be the result of individual variation, and not of any taxonomic significance. The ninth costal is probably an atavism, a condition where a primitive trait is occasionally expressed (Brinkman and Joyce 2010, pers. comm.). Unfortunately, nowhere in Gilmore's description of the holotype of *N. baueri* did he identify any characters that would allow *N. baueri* to be distinguished from *N. eximius*. However, Larson et al. (2012) re-diagnosed *N. eximius* based on new material and distiguished *N. eximius*, in part, as having "intergulars only barely separating gulars with little or no shared sulcus with the humerals, and sigmoid intergular–gular sulcus oriented anterolaterally to posteromedially, creating a heart shape." This differs from the U-shaped intergulars and gulars not in contact with the mid-line in *N. baueri*. This condition is essentially the same as seen in ROM 864, as illustrated by Larson et al. (2012, Fig. 21.1d).

We note here that ROM 864, a specimen collected by Charles H. Sternberg and sold to Ward's Natural Science Establishment, and later purchased by the Royal Ontario Museum in 1933, is said to be from the Fruitland Formation, however, it is more likely to be from the lower Kirtland Formation (Hunter Wash Member).

Wiman (1933) described a number of specimens collected by C. H. Sternberg, and most, if not all of them, are from the lower Kirtland Formation (although he noted that one came from the "Ojo Alamo Formation," but based on its preservation, we consider that highly unlikely).

A newly collected specimen, SMP VP-2379 (Fig. 20.6c, d), consists of a carapace and plastron that are incomplete, slightly crushed, and distorted. The carapace is cracked, and a large portion of the right side is missing (Fig. 20.6c). The plastron (Fig. 20.4d) is nearly complete and has the same arrangement of gular and intergulars as in the holotype of *Neurankylus baueri* (Fig. 20.4b). Overall, SMP VP-2379 is larger, more robust, and appears to have a more oval shape, compared to the holotype of *N. baueri* (Fig. 20.6a, b). However, when accounting for the distortion, our calculations of length-to-width ratios for both the holotype of *N. baueri* and SMP VP-2379 are very close: 1.15–1.27, respectively.

Sullivan and Lucas (2006) considered *Neurankylus baueri* to be distinct from *N. eximius* primarily based on having the first suprapygal shorter and wider than that in *N. eximius*, but we now acknowledge this is probably due to individual variation. We accept the rediagnosis of *N. eximius* by Larson et al. (2012) and note that the San Juan Basin Fruitland-Kirtland specimens all have U-shaped intergulars and the gulars do not contact the midline.

Thescelus Hay 1908

Thescelus hemispherica Gilmore 1935

(Fig. 20.7)

Holotype: USNM 12818 (Fig. 20.7a, b), incomplete carapace and plastron.

Holotype locality, **unit**, **and age**: Three miles northeast of Hunter's Store (Bisti Post Office), SW ¼, T 24N, R13W, San Juan County, New Mexico; Hunter Wash Member, Kirtland Formation; late Campanian (early Kirtlandian).

Referred specimen: PMU.R23 (Fig. 20.7c, d), incomplete carapace and plastron.

Occurrence: San Juan Basin, New Mexico; Hunter Wash Member, Kirtland Formation; late Campanian (early Kirtlandian).

Remarks: Gilmore (1935) established the species *Thescelus hemispherica* based on USNM 12818 (Fig. 20.7a, b), an incomplete carapace and plastron from what is now known as the Hunter Wash Member of the Kirtland Formation. He distinguished *T. hemispherica* from *T. insiliens* based on: (1) "the bosslike ornamentation of the carapace;" (2) "the relatively wider vertebrals;" (3) "posterior border of carapace without constructions;" and (4) "the nuchal less deeply excavated" (Gilmore 1935, pp. 176–177). Gilmore (1935, p.177) further distinguished *T. hemispherica* from *T. rapiens* Hay 1908 in having: (1) "a median depression along the back;" (2) relatively wider vertebrals;" and (3) "rough sculpture of the carapace." The features used by Gilmore (1935) to distinguish *T. hemispherica* from *T. rapiens* may be, in part, problematic (for example, the relative widths of the vertebrals) and the two taxa may be synonymous. However, presently we retain them as distinct species, pending further evidence (see account below for *T. rapiens*).

Thescelus rapiens Hay 1908

(Fig. 20.8)

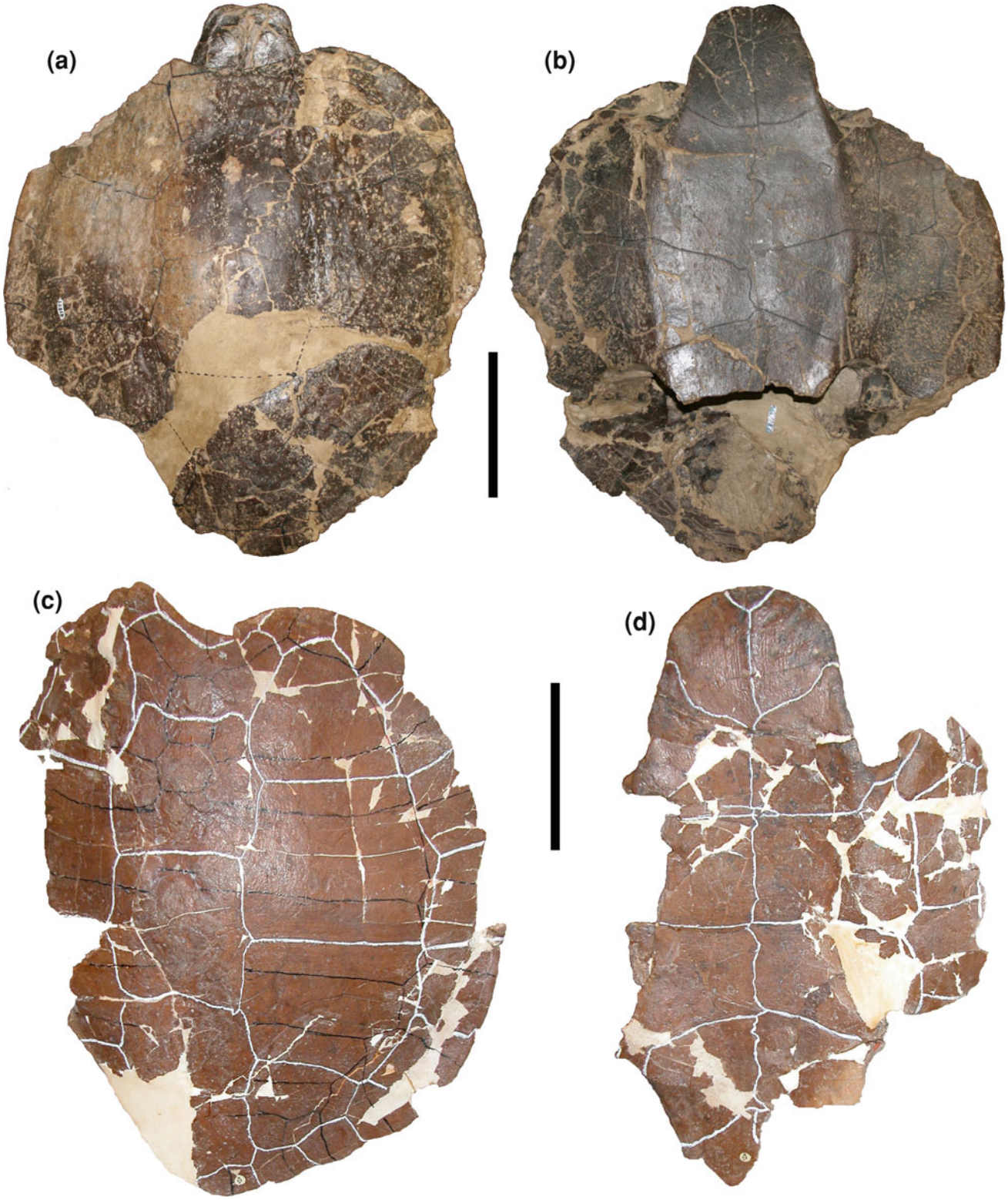


Fig. 20.7 *Thescelus hemispherica* Gilmore 1935. **a**, **b** USNM 12818 (holotype), incomplete carapace and plastron: **a** carapace, in dorsal view; **b** plastron, in ventral view. **c**, **d** PMU.R23, incomplete carapace and plastron: **c** carapace, in dorsal view; **d** plastron, in ventral view. Specimens at different magnifications; bar scales = 10 cm

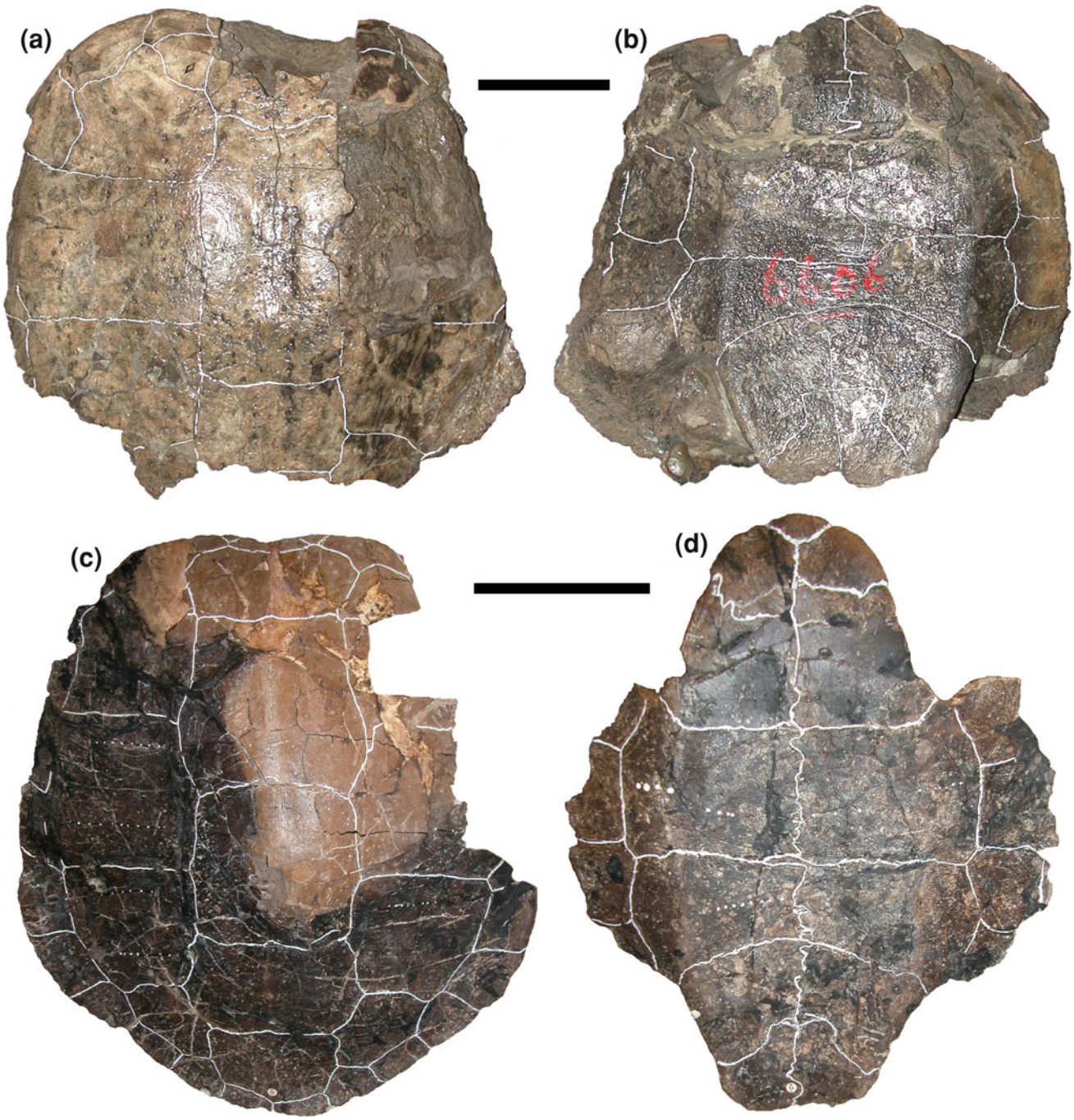


Fig. 20.8 *Thescelus rapiens* Hay 1908. **a**, **b** AMNH 6066 (holotype), incomplete carapace and plastron: **a** carapace, in dorsal view; **b** plastron, in ventral view. **c**, **d** PMU.R22, incomplete carapace and plastron: **c** carapace, in dorsal view; **d** plastron, in ventral view. Specimens at different magnifications; bar scales = 10 cm

Holotype: AMNH 6066 (Fig. 20.8a, b), incomplete carapace and plastron.

Holotype locality, **unit**, **and age**: Ojo Alamo, San Juan County, New Mexico; De-na-zin Member, Kirtland Formation; late Campanian (late Kirtlandian).

Referred specimen: PMU. R22 (Fig. 20.8c, d), incomplete carapace and plastron.

Occurrence: San Juan Basin, New Mexico; Hunter Wash and De-na-zin members, Kirtland Formation (late Campanian; Kirtlandian).

Remarks: Hay (1908) established the species *Thescelus insiliens* and *T. rapiens* for specimens from the "Laramie" beds of Wyoming (AMNH 1108) and from the "Laramie" deposits at Ojo Alamo (AMNH 6066), respectively. The holotype of

T. insiliens is from what is now considered the Lance Formation (late Maastrichtian; Lancian). The holotype of *T. rapiens* was collected at the same locality as the holotype of the dinosaur *Kritosaurus navajovius* (Brown 1910), which we know to be in the De-na-zin Member (late Campanian; late Kirtlandian) of the Kirtland Formation (Gilmore 1916; Lehman 1981).

Gaffney (1972), in reviewing this taxon, provided a restoration of *Thescelus insiliens* based on two specimens from different geologic horizons and different geographic regions. He recognized 12 characters that serve to diagnose the genus, which he considered to be monotypic. Three species were placed into synonymy: *T. rapiens*, *T. hemispherica* and *Baena longicauda* Russell 1934 (Gaffney 1972). However, Sullivan and Lucas (2006) noted differences in patterns of bones-to-scutes in PMU.R22 and PMU.R23, a pattern that differs from the stratigraphically higher *T. insiliens*. Moreover, we can further distinguish *T. insiliens* from the two Kirtland taxa based on the constricted posterior border of the carapace and on the femoral notch width of the plastron, which is greater than the humeral notch width.

The remaining characters that Gilmore (1935) used to differentiate the three species of *Thescelus* are: (1) presence of ornamentation on the carapace (*T. hemispherica*); (2) relatively wider vertebrals (*T. hemispherica*); (3) less deeply excavated nuchal (*T. hemispherica* and *T. rapiens*?); and (4) median depression along the back (*T. rapiens*). Re-assessment suggests that these features are questionably useful for determining phylogenetic relationship and taxonomic identity. The ornamentation, where preserved, is not pronounced. The significance of the "relatively wider vertebrals" is unclear and may be variable. It is our opinion that all members of *Thescelus* had excavated nuchals, and the degree to which they are excavated is variable and taxonomically insignificant. Lastly, the median depression along the midline of the carapace may be an artifact of preservation.

Although it is evident that we can clearly separate the stratigraphically younger species (*Thescelus insiliens*) from the two Kirtland Formation species (*T. rapiens* and *T. hemispherica*), it remains difficult to differentiate the latter two species from one another. It may be that *T. hemispherica* is restricted to the lower Kirtland Formation (Hunter Wash Member), and *T. rapiens* is from both the lower and the upper Kirtland Formation (Hunter Wash and De-na-zin members). Based on the material in the Uppsala collection, we tentatively place PMU R.22 in *T. rapiens*, as per Wiman (1933), and PMU R.23 in *T. hemispherica*, as per Gilmore (1935).

Thescelus sp.

Referred specimen: SMP VP-2100 (not figured), nearly complete plastron with carapace fragments. Collected from SMP locality 421, Alamo Mesa (southwest), SW ¼, Sec. 27, T24N, R12W, San Juan County, New Mexico, within the Hunter Wash Member of the Kirtland Formation.

Remarks: SMP VP-2100 is assigned to *Thescelus* sp., because it lacks specific characters that would permit assignment to either *T. rapiens* or *T. hemispherica*. Even so, we note that it is morphologically similar to PMU.R22, which we tentatively referred (see above) to *T. rapiens*.

Baenidae Indeterminate

Referred specimens: See Appendix for complete list of referred specimens.

Remarks: Based on the descriptions and illustrations provided by Tomlinson (1997), we consider specimens from the Big Bend region of Texas to be insufficient for any genus or species assignment. The fragmentary specimens from New Mexico cannot be assigned to either *Denazinemys nodosa* or *Scabremys ornata* with any level of confidence. Moreover, we note that some specimens of *Thescelus* and *Boremys* have nodose texture on sections of the carapace similar to that seen in *D. nodosa* and *S. ornata*, making isolated fragments of carapace material impossible to identify to genus level. For now we tentatively consider all this material to be Baenidae indeterminate.

Eucryptodira Gaffney 1975
Kinosternoidea Gaffney and Meylan 1988
Genus and species indeterminate
(Fig. 20.9)

Referred specimens: See Appendix for complete list of referred specimens.

Occurrence: San Juan Basin, New Mexico; De-na-zin Member, Kirtland Formation; late Campanian (late Kirtlandian).

Description: The first specimen, SMP VP-1907 (not figured), consists of an incomplete left hypoplastron bearing a prominent sulcus that separates the femoral from the abdominal. It is broken along the medial side, so the medial half of the left hypoplastron is missing. The sutural contact with the hyoplastron is preserved anteriorly. Posteriorly the distal end is also broken. The ventral (external) surface is flat and bears a smooth, fine-textured surface, consisting of short, entwined, fiber-like sculpturing with numerous minute foramina. The internal (visceral) surface is also smooth. It is relatively thick and becomes pinched at the femoral notch. It measures 0.53 cm in maximum thickness.

SMP VP-2004 (Fig. 20.9a–d) consists of a right hypoplastron and two incomplete costals. The right hypoplastron consists of the anterior portion where, in life, it would have articulated with the hypoplastron. It is slightly thicker than SMP VP-1907, measuring 0.58 cm. The suture surface is preserved along the anterior and medial parts of the element, as well as along the posterior part where it would have articulated with the xiphiplastron. It is broken

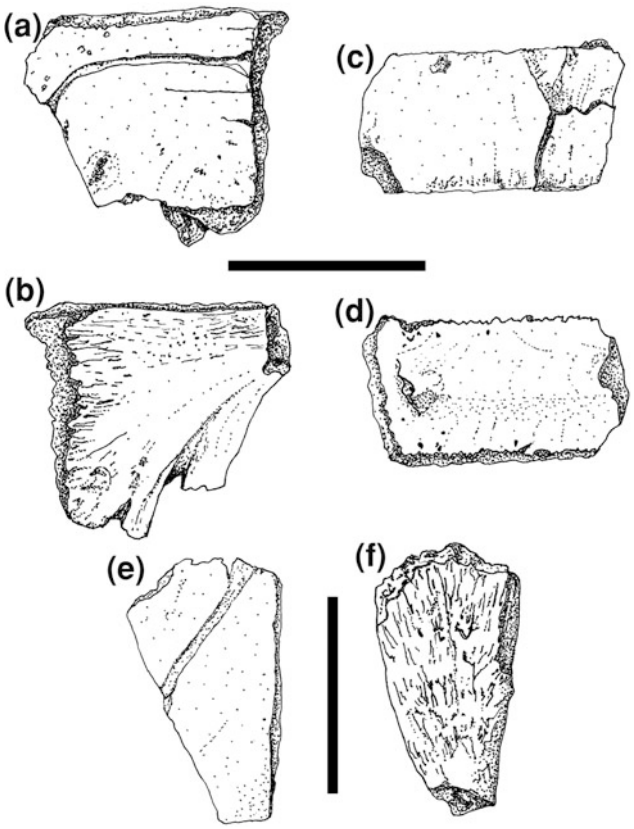


Fig. 20.9 Kinosternoidea indeterminate. **a–d** SMP VP-2004, right hypoplastron and two incomplete costals: **a**, **b** anterior part of right hypoplastron: **a** ventral view; **b** visceral view; **c**, **d** right costal 5: **c** dorsal view; **d** visceral view. **e**, **f** SMP VP-2009, nearly complete right xiphiplastron: **e** ventral view; **f** visceral view. Specimens at different magnifications; bar scales = 1 cm

laterally. The two incomplete costals are also broken laterally. The dorsal (external) surface of one is partly eroded, and there is no trace of any sulci, so it is identified as costal 1. The other (Fig. 20.9c, d) bears sulci of the vertebrals (Fig. 20.9c), but lacks that of the pleurals, so it is tentatively identified as right costal 5. The internal surfaces of both costals preserve the costal ribs, the heads of which are broken medially.

SMP VP-2009 (Fig. 20.9e, f) is a nearly complete right xiphiplastron; only the posterior (caudal) tip of the element is broken. The medial edge has a prominent sutural surface, and the anterior edge is marked by an interdigitating sutural surface where it would have articulated with the right hypoplastron. The maximum thickness is along the medial suture, and the bone tapers laterally. In medial cross-section view, the distal part of the xiphiplastron gently curves upward (dorsally). The texture is the same as seen in the other specimens. The femora-anal sulcus extends just lateral from the midline, posterolaterally to the edge, anterior to the midsection of the element.

SMP VP-2533 (not figured) is tentatively identified as a right costal 8. The element has an elongate, sub-trapezoidal shape. The medial end is narrow, with the lateral end wider. The anterior, posterior, and medial edges are strongly sutured. The lateral edge is broken anteriorly and thins laterally, lacking any sutural surface. Dorsally, there are two scallop-like sulci, which we think are the vertebral 4 (towards the midline) and pleural 4 (laterally), with vertebral 5 lying posteriorly. Another sulcus extends posteriorly from between the two scalloped impressions. A small crescent-shaped sulcus lies lateral to the posterior edge of the previous one. Neither of the sulci is identifiable, and these demarcations may not be actual sulci. Internally, there is a prominent, thin costal rib.

The last specimen, SMP VP-3274 (not figured), is an incomplete ?left costal 2. It is prominently sutured on the anterior, medial and posterior sides. It is thickest toward the midline and thins laterally. It is estimated that it represents less than half of the complete costal. Dorsally, there is a prominent sulcus. Internally, the head of the rib is close to the midline. The external surface texture is the same as in the preceding specimens.

Remarks: Five specimens are here referred to the Kinosternoidea based on features of the carapace and plastron as well as the distinctive smooth sculpturing. They are identical to specimens recently reported by Brinkman and Rodriguez de la Rosa (2006) from the Campanian Cerro del Pueblo Formation of Mexico. These specimens share the same smooth surface sculpturing, consisting of fine, short, entwined, fiber-like structures with numerous minute foramina.

Brinkman and Rodriguez de la Rosa (2006) referred the Cerro del Pueblo Formation specimens to the Kinosternoidea, genus and species indeterminate, based on the presence of two derived features cited by Hutchison (1991). These are: (1) the contact between the plastral bridge and the carapace is reduced to peripherals four to six; and (2) the vertebrals are distinctly hexagonal. Although none of the SMP specimens preserves the region between the plastral bridge and the carapace, the presence of the second feature is confirmed based on the costal material. We note, too, that the right hypoplastron (SMP VP-2004) is identical to that of SEPCP 48/485 illustrated by Brinkman and Rodriguez de la Rosa (2006, Fig. 4B).

Sankey (2006) referred material from the Aguja Formation of Texas to the Kinosternoidea as cf. *Hoplochelys*, but this material does not conform to the SMP specimens and is not considered further.

All five SMP specimens were recovered at a single collecting site, called the "John Burris Microsite," located within the general locality SMP loc. 350 (east branch of Hunter Wash [west end]), in the De-na-zin Member, Kirtland Formation. The presence of a kinosternoid in the De-na-zin Member (Kirtland Formation) that is similar to the Cerro del Pueblo Formation kinosternoid, further supports the interpretation that the upper Kirtland Formation

may be correlative to the lower part of the Cerro del Pueblo Formation, which thus may be partly of Kirtlandian age (Sullivan and Lucas 2006).

Adocidae Cope 1870
Adocus Cope 1868
Adocus bossi Gilmore 1919
(Fig. 20.10a, b)

Holotype: USNM 8613 (Fig. 20.10a, b), incomplete carapace and nearly complete plastron.

Holotype locality, **unit**, **and age**: Head of Ah-shi-sle-pah Wash, Sec. 3, T22N, R10W, San Juan County, New Mexico; Hunter Wash Member, Kirtland Formation; late Campanian, early Kirtlandian.

Referred specimen: USNM 8577, nearly complete plastron and incomplete carapace.

Occurrence: San Juan Basin, New Mexico; Hunter Wash Member, Kirtland Formation; late Campanian (early Kirtlandian).

Remarks: Gilmore (1919) named two species of *Adocus* from the Hunter Wash Member of the Kirtland Formation, *A. bossi* (Fig. 20.10a, b), and *A. kirtlandius* (Fig. 20.10c, d). Gilmore (1919) distinguished *A. bossi* from *A. kirtlandius* (below) in having: (1) coarse carapace surface texture (three "pits" within 5 mm); (2) seven neurals; (3) eighth costals with wide proximal ends; (4) vertebral scutes longer than wide; (5) long anal scutes; (6) rounded posterior lobe of the plastron; and (7) larger size. A few of these characters may be related to ontogeny, specifically the coarser surface texture, larger size, length of the anal scutes and possibly the shape of the eighth costals. The remaining characters still serve to distinguish the two species.

Adocus kirtlandius Gilmore 1919
(Fig. 20.10c, d)

Holotype: USNM 8593 (Fig. 20.10c, d), incomplete carapace and nearly complete plastron.

Holotype locality, **unit**, **and age**: South side of Ah-shi-sle-pah Wash, Sec. 4, T22N, R10W, San Juan County, New Mexico; Hunter Wash Member, Kirtland Formation; late Campanian (early Kirtlandian).

Occurrence: San Juan Basin, New Mexico; Hunter Wash Member, Kirtland Formation; late Campanian (early Kirtlandian).

Remarks: The holotype of *Adocus kirtlandius* (USNM 8593) consists of an incomplete shell and it is the smaller of the two *Adocus* holotypes from the Kirtland Formation. Gilmore (1919) distinguished this species from *A. bossi* in having: (1) finer surface texture (four or five "pits" within 5 mm); (2) eight neurals; (3) eighth costals with narrow proximal ends; (4) vertebral scutes wider than long; (5) anal scutes short; (6) posterior lobe of the plastron squared-off; and (7) smaller size.

Wiman (1933), in his paper concerning the turtles collected by C. H. Sternberg housed in the Uppsala collection, did not address, or document, specimens of *Adocus*.

Mateer (1981) also did not comment on *Adocus*, other than noting it was similar to *Basilemys* Hay 1902. There is an uncatalogued incomplete plastron in the Uppsala collection (labeled "carapace" and listed as Sternberg's No. 22) that has been identified as *Adocus*. However, the anterior portion of the plastron conforms to *Denazemys nodosa* in having divided gulars and extragulars. Thus, there are no specimens of *Adocus* among the material in the Uppsala collection. Armstrong-Ziegler (1980) cited MNA Pl.1646, isolated carapace and plastron fragments, as pertaining to *Adocus* sp., but further noting the carapace texture to have "three rows of pits in a 5-mm. line," thus putting the specimen within the textural definition of *A. bossi*. However, we have not seen this specimen, so we cannot confirm this observation.

Adocus sp.
(Fig. 20.11)

Referred specimens: See Appendix for complete list of referred specimens.

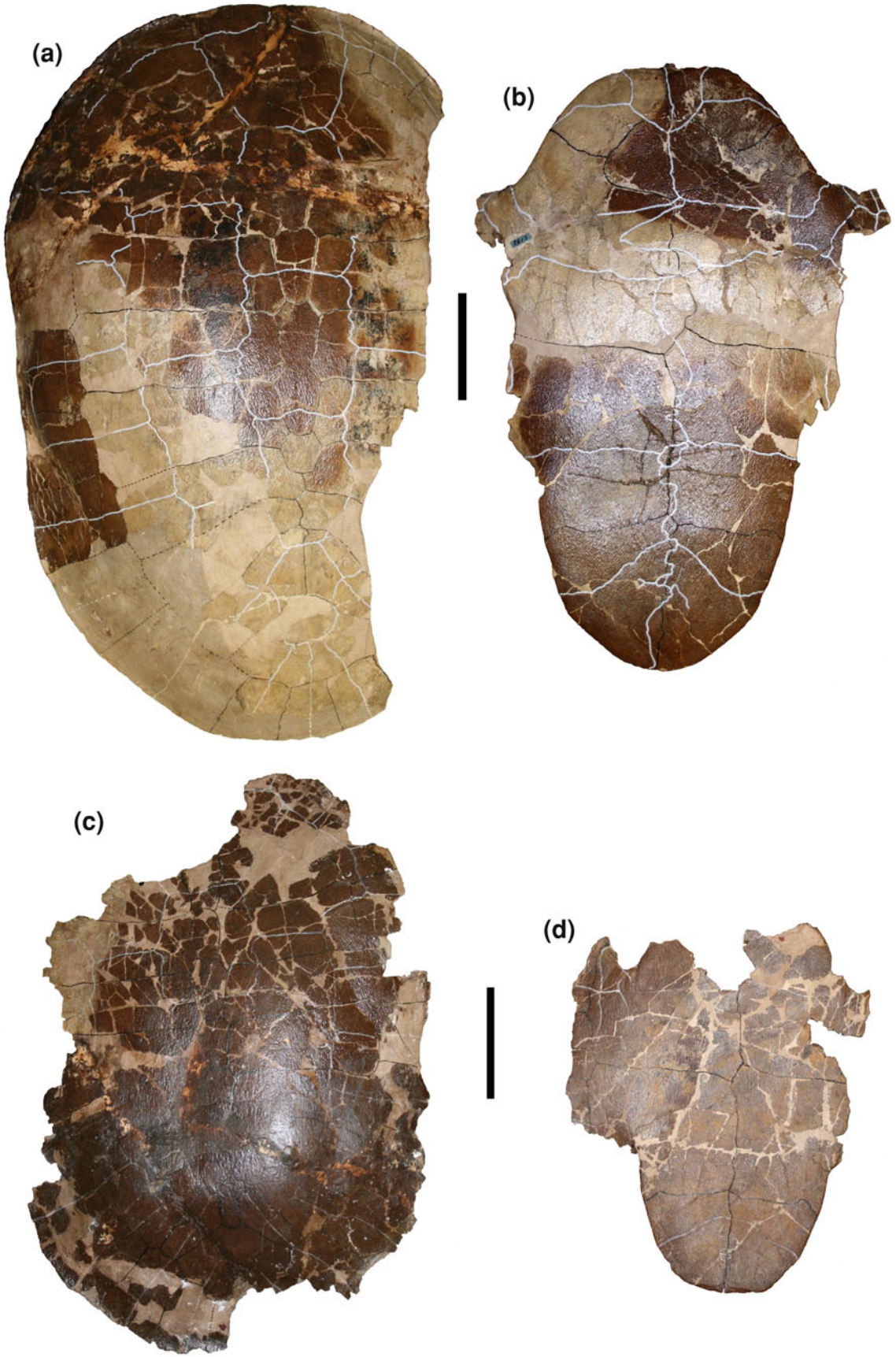
Remarks: Due to difficulties in discriminating between the two species of *Adocus*, all the incomplete and fragmentary material is assigned to *Adocus* sp. We note here that a single incomplete peripheral (SMP VP-1328) is noteworthy because it preserves the color pattern on the dorsal (external) side (Fig. 20.11). This pattern consists of a patchwork of dark polygons separated by narrower, more prominent and more linear, light-colored segments of the carapace. This pattern is too regular to be due to leaching and/or weathering. Color patterns on fossil turtle shells are rare and having been reported twice before, once in *Neurankylus* sp. from the Paleocene (Puercan) of New Mexico and once in *Chrysemys picta* (Schneider 1783) from the Miocene (Barstovian) of Nebraska (Holman and Sullivan 1981; Sullivan et al. 1988).

Nanhsiungchelyidae Yeh 1966
Basilemys Hay 1902
Basilemys nobilis Hay 1910

Holotype: USNM 6555, fragments of carapace and plastron (hypoplastron and xiphiplastron).

Holotype locality, **unit**, **and age**: Ojo Alamo, San Juan County, New Mexico; "Ojo Alamo beds," 50 feet above the lower conglomerate in Naashoibito Member, Ojo Alamo Formation; early Maastrichtian (late "Edmontonian").

Remarks: Hay (1910) established *Basilemys nobilis* based on carapace and plastron material, most notably parts of the hypoplastron and xiphiplastron, from the "Ojo Alamo" beds. The material upon which this species is based is not diagnostic and cannot be distinguished from other species of *Basilemys* (*B. variolosa* [Cope 1876], *B. praeclara* Hay 1910, and


(a)
(b)
(c)
(d)

◀**Fig. 20.10** *Adocus* species from the Fruitland and Kirkland formations. **a**, **b** *Adocus bossi* Gilmore 1919; USNM 8613 (holotype), partial carapace and nearly complete plastron: **a** carapace, in dorsal view; **b** plastron, in ventral view. **c**, **d** *Adocus kirtlandicus* Gilmore 1919; USNM 8593 (holotype), partial carapace and nearly complete plastron: **c** carapace, in dorsal view; **d** plastron, in ventral view. Specimens at different magnifications; bar scales = 10 cm

Fig. 20.11 *Adocus* sp. SMP VP-1328, peripheral fragment with color pattern preserved, in dorsal view. Bar scale = 1 cm

B. sinuosa Riggs 1906). Moreover, the specimen (USNM 11084) previously, and provisionally, referred to *B. nobilis*, was noted by Gilmore (1935, p. 179) as being impossible to identify with certainty. We agree with Gilmore (1935) that the holotype is inadequate, so we regard *B. nobilis* as a nomen dubium.

Basilemys gaffneyi sp. nov.
(Fig. 20.12)

Synonymies: *Basilemys nobilis*: Hay 1910 [in part]; Wiman 1933, Fig. 7; Mateer 1981, p. 68, text-figs. 3, 4. *Basilelmys nobilis*: Hay 1910 [in part]; Gilmore 1935, p. 178, Figs. 13, 14.

Holotype: USNM 11084 (Fig. 20.12a, b), nearly complete carapace and plastron (see Remarks).

Holotype locality, **unit**, **and age**: Two miles above Hunter's Store (Bisti Post Office), San Juan County, New Mexico; Hunter Wash Member, Kirtland Formation; late Campanian (Kirtlandian).

Diagnosis: Differs from all other species of *Basilemys* in having an undivided gular.

Referred specimens: PMU.R29 (Fig. 20.12c, d), nearly complete carapace and plastron; SMP VP-3368 (not figured), incomplete plastron. See also Appendix .

Occurrence: San Juan Basin, New Mexico; upper part of Fruitland Formation and lower part of Kirtland Formation; late Campanian (Kirtlandian).

Remarks: The distinguishing features of "*Basilemys nobilis*" were exclusively derived from two referred specimens (PMU.R29 and USNM 11084), which we here consider to be *B. gaffneyi*. Hay (1910) distinguished "*B. nobilis*" as having an inner slope of the xiphiplaston that drops off rapidly compared to *B. praeclara* and *B. variolosa*, but we regard this difference as taxonomically insignificant, because this severity in slope is probably due to individual variation. Wiman (1933) described a nearly complete shell (PMU.R29a,b; Fig. 20.12c, d) collected by Charles H. Sternberg from the lower Kirtland Formation (Hunter Wash Member) at Ah-shi-sle-pah Wash (formerly Meyers [= Myers] Creek) and identified it as "*B. nobilis*." Wiman (1933) mistakenly identified a pair of marginals as posterior inframarginals. Two years later, Gilmore (1935) described a nearly complete carapace and plastron, USNM 11084 (Fig. 20.12a, b), which is also assigned to "*Basilemys nobilis*". Later, Langston (1956) contrasted "*B. nobilis*" with *B. variolosa*, concluding it has a number of features (apomorphies) that set it apart from *B. variolosa* based on PMU.R29 (Fig. 20.12c, d). These include: (1) more oval shell; (2) large triangular inframarginal scale interposed basely between peripherals 6 and 7; and (3) "intergular" scale undivided.

Armstrong-Ziegler (1980) reported a putative ?*Basilemys* sp. from the Fruitland Formation based on shell fragments (MNA Pl.1647). Her description of the surface texture suggests that these fragments are not *Basilemys*, but instead may be referable to *Adocus*. However, we have not seen this material and are unable to confirm this.

Mateer (1981) noted that the Uppsala specimen (PMU.R29) bore little similarity to USNM 11084 (Fig. 20.12a, b), differing only in the absence of an anteriorly expanded first vertebral (= central). However, our examination of USNM 11084 challenges Mateer's contradictory statement, which belies the fact that the two specimens in question are nearly identical in all respects.

Brinkman and Nicholls (1993) recognized four species of *Basilemys* (*B. variolosa*, "*B. nobilis*," *B. praeclara* and *B. sinuosa*). Both *B. variolosa* and "*B. nobilis*" lack inframarginal scales, whereas both *B. praeclara* and *B. sinuosa* are united by v-shaped extragulars (meeting at the

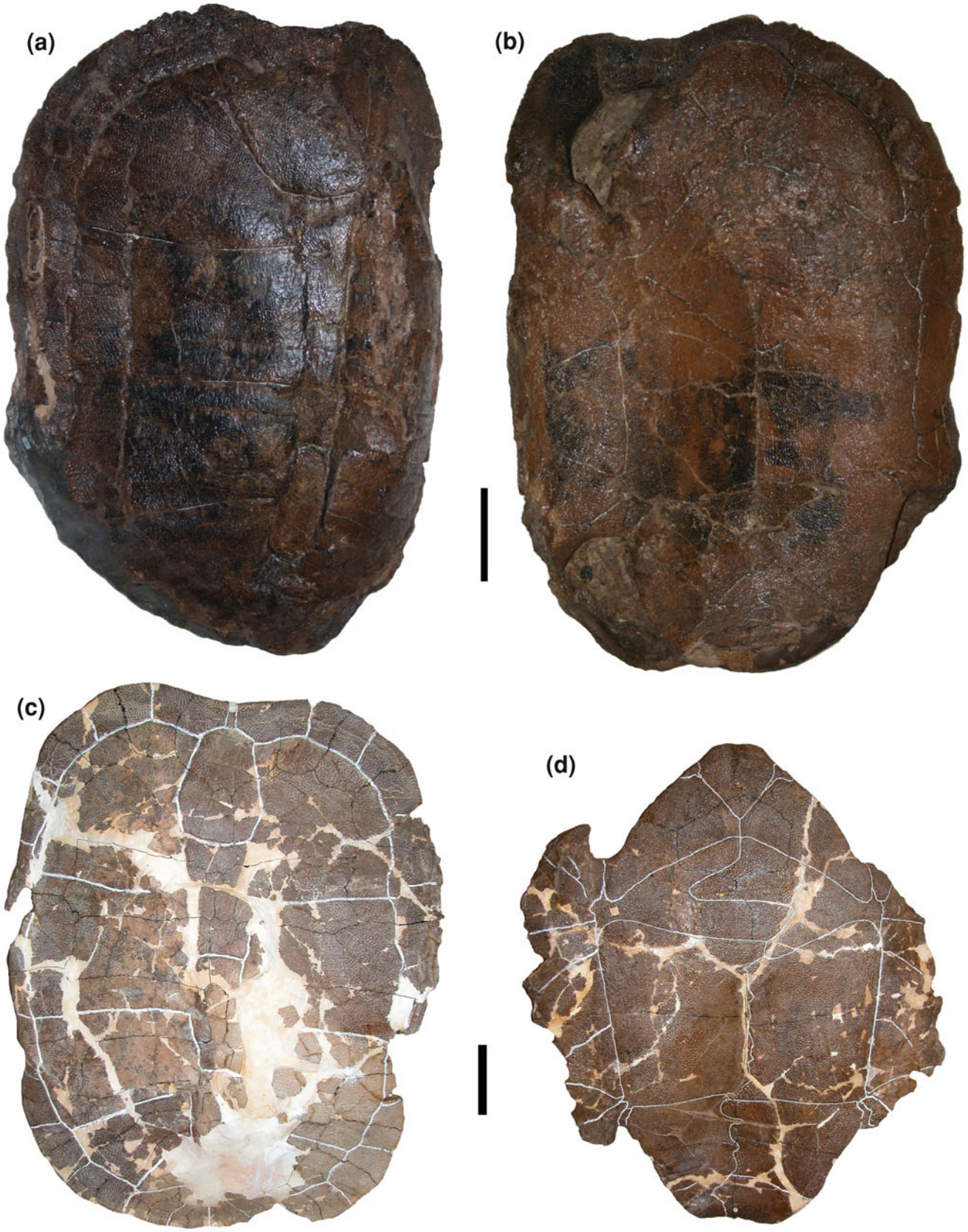


Fig. 20.12 *Basilemys gaffneyi* sp. nov. **a**, **b** USNM 11084 (holotype), nearly complete carapace and plastron: **a** carapace, in dorsal view; **b** plastron, in ventral view. **c**, **d** PMU.R29, incomplete carapace and plastron: **c** carapace, in dorsal view; **d** plastron, in ventral view. Specimens at different magnifications; bar scales = 10 cm

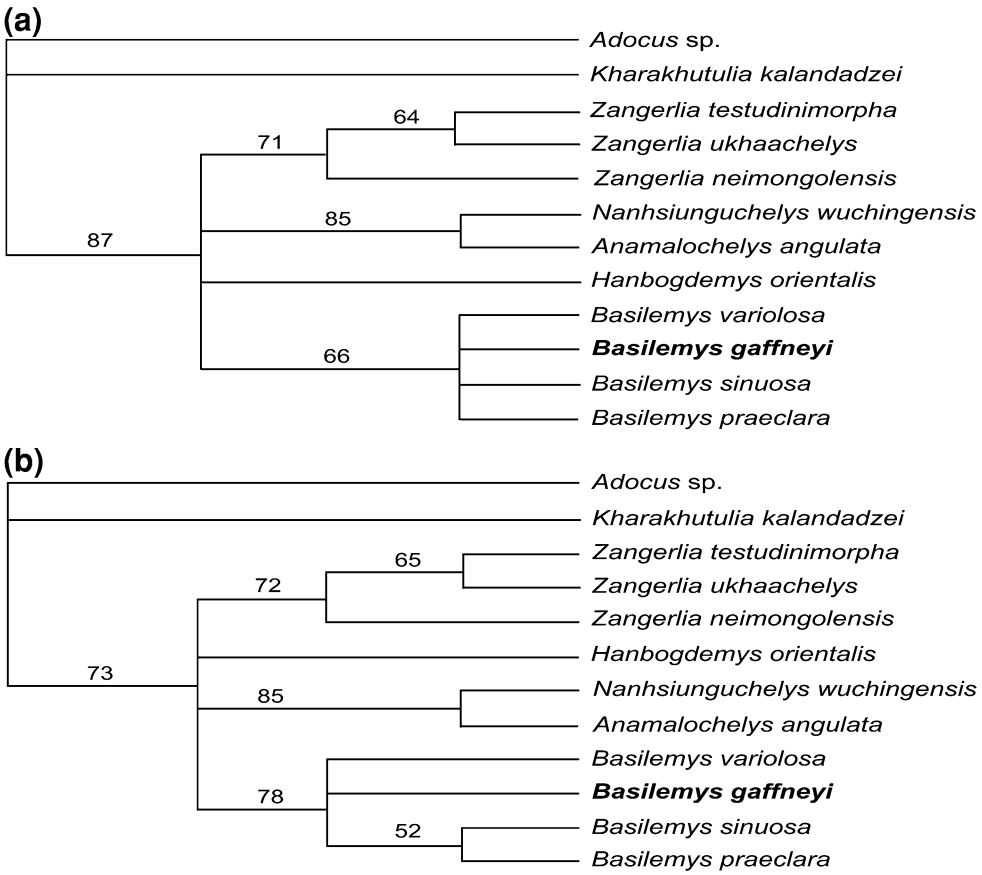


Fig. 20.13 Two cladograms for the Nanhsiungchelyidae, showing the phylogenetic relationship of *Basilemys gaffneyi* sp. nov. **a** Best tree (tree length = 53) excluding geography; **b** best tree (tree length = 55), including geography. Data matrix extracted from Joyce and Norell (2005) with two additional characters (see text)

midline); extragulars almost separating humerals; strongly sinuous course of the median sulcus; and pygal bone wider than long (Brinkman and Nicholls 1993).

The phylogenetic relationships of Mesozoic turtles have been recently reviewed by Joyce (2007). More specifically, there have been a number of studies concerning the taxa and phylogenetic relationships of taxa assigned to the Nanhsiungchelyidae. These include: Brinkman and Nicholls (1993), Brinkman and Peng (1996), Hirayama et al. (2001), Joyce and Norell (2005), Sukhanov and Narmandakh (1975), (1977), (2006), Sukhanov et al. (2008), and Yeh (1966).

We ran two phylogenetic analyses using PAUP 4.0b10 (Swofford 2002), incorporating the characters used by Joyce and Norell (2005) and the supplemental characters of Sukhanov et al. (2008). We scored the characters for *Basilemys gaffneyi*. We included characters 40 (sculpturing of the shell surface with relatively big and irregular pits and grooves) and 41 (overlapping of scales on the dorsal surface of the plastral lobes) from Sukhanov et al. (2008) and changed character 40 (geographic distribution) from Joyce and Norell (2005) to character 42. We amended character 37 (inframarginals) and character state (1) to be two or one pair. Characters were unordered and had equal weight. The two analyses produced the following: one without geography—yielding 18 most parsimonious trees, with a tree length = 53, consistency index = 0.8364, retention index = 0.7714; rescaled consistency index = 0.6434; and the other with geography—also yielding 18 most parsimonious trees, with a tree length = 55, consistency index = 0.8364, retention index = 0.7692. Bootstrap 50% majority rule consensus trees were generated for both runs (Fig. 20.13). The North American genus *Basilemys* forms a distinct clade, even in the analysis without coding for geography (Fig. 20.13a).

We are of the opinion that the differences between the holotype of *B. gaffneyi* (USNM 11084) and PMU.R29 are taxonomically insignificant. Both specimens are from the same geographic region and stratigraphic horizon (Hunter Wash Member, Kirtland Formation). We chose USNM 11084 as the holotype, because it is the more complete and better-preserved specimen.

Trionychidae (Fitzinger 1826)
Aspideretoides Gardner et al. 1995
Aspideretoides austerus (Hay 1908)
(Figs. 20.14, 20.15c)

Synonymies: *Aspideretes austerus*: Hay 1908, p. 495. *Aspideretes fontanus*: Hay 1908, p. 494. *Aspideretes vorax*: Hay 1908, p. 496.

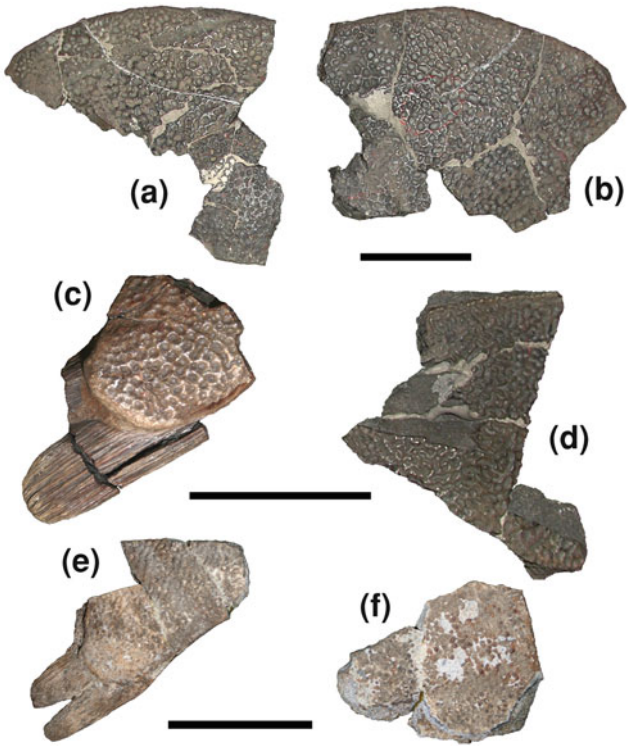


Fig. 20.14 *Aspideretoides austerus* (Hay 1908). **a**–**d**, AMNH 6068 (holotype): **a** and **b** left and right parts of anterior portion of carapace, each preserving lateral portion of nuchal and adjacent costals, both in dorsal view; **c** and **d** sections of right hypoplastron, both in ventral view. **e**, **f** SMP VP-1717: **e** lateral portion of right hypoplastron, in ventral view; **f** associated hypoplastron fragment, in ventral view. Specimens at different magnifications; bar scales = 5 cm

Holotype: AMNH 6068 (Fig. 20.14a–d), left and right parts of anterior portion of carapace, each preserving lateral portion of nuchal and adjacent costals, and right hypoplastron, consisting of two broken pieces.

Holotype locality, **unit**, **and age**: Ojo Alamo, San Juan County, New Mexico; De-na-zin Member, Kirtland Formation (late Campanian; late Kirtlandian).

Referred specimens: See Appendix for complete list of referred specimens.

Occurrence: San Juan Basin., New Mexico; De-na-zin Member, Kirtland Formation; late Campanian (Kirtlandian).

Remarks: Hay (1908) named three species of "*Aspideretes*"—*A. austerus*, A. *fontanus* and A. *vorax*; all here considered species of the genus *Aspideretoides* Gardner et al. 1995—from the "Ojo Alamo/Laramie beds" of the San Juan Basin, New Mexico. The holotype specimens, AMNH 6068 (*A. austerus*, Fig. 20.14a–d), AMNH 6070 (*A. fontanus*), and AMNH 6140 (*A. vorax*), are incomplete, represent different parts of the carapace and plastron, and have nearly identical sculpturing and shell thickness. Morphological differences are insignificant and are considered by us to be individual variation. We designate *Aspideretoides austerus* as the valid species, because it is the most diagnostic of the three species named. We recognize *A. fontanus* and *A. vorax* as subjective junior synonyms of *A. austerus*. All three specimens have identical preservation, and a bluish-gray color with dark maroon specks or clumps of hematite. Hematite adhering to bluish-gray fossil bone is common only in specimens that come from the shaly De-na-zin Member of the Kirtland Formation and not the overlying Naashoibito Member of the Ojo Alamo Formation. It is the same preservation seen in SMP VP-1717 (Fig. 20.14e, f), which was also collected in the De-na-zin Member of the Kirtland Formation. Therefore, we argue that all the holotype material is from the De-na-zin Member.

Aspideretoides robustus (Gilmore 1919) new combination (Figs. 20.15a, b, d, 20.16)

Synonymies: *Plastomenus* (in part): Cope 1873. *Plastomenus robustus*: Gilmore 1919, p. 53, Figs. 23 and 24, pls. 17 and 18.1. *Plastomenus* sp.: Mateer 1981, p. 70, text-fig. 3.6. "*Plastomenus*" *robustus*: Sullivan and Lucas 2006, p. 18.

Holotype: USNM 8538 (Figs. 20.15a, 20.16c, in part), complete carapace. (The right hyoplastron and hypoplastron are excluded from the holotype and, for reasons discussed below, are considered a referred specimen.)

Holotype locality, **unit**, **and age**: South side of Ah-shi-sle-pah Wash, Sec. 4, T22N, R10W, San Juan County, New Mexico; Hunter Wash Member, Kirtland Formation; late Campanian (early Kirtlandian).

Referred specimens: See Appendix for complete list of referred specimens.

Occurrence: San Juan Basin, New Mexico; lower part of Kirtland Formation (Hunter Wash Member) and, possibly, upper part of Fruitland Formation (Fossil Forest Member); late Campanin (Kirtlandian).

Revised diagnosis: Differs from *Aspideretoides splendidus* (Hay 1908) in the xiphipastron having a broader medial contact with the anterior portions arched forward, and a broad contact with the posterior margins of the hypoplastra. Differs from *Aspideretoides austerus* in having a broader hypoplastron; and the posterior margin of the hypoplastron deep, resulting in a more acute margin than in *A. splendidus* and *A. austerus*. Lateral and medial margins of the hypoplastron and hyoplastron directed anteroposteriorly and subparallel.

Remarks: Gilmore (1919) established the species *Plastomenus robustus* based on USNM 8538 (holotype), which according to Gilmore (1919) was collected by J. B. Reeside, Jr. from the southern part of section 2, T22N, R10W, in Ah-shi-sle-pah Wash, in the lower part of the Kirtland Formation (Hunter Wash Member). The fused nature of the plastral elements (hyoplaston + hypoplastron) was the reason Gilmore (1919) assigned USNM 8538 to the genus *Plastomenus*. Our examination of the carapace and the fused right hyoplastron + hypoplaston reveal that the

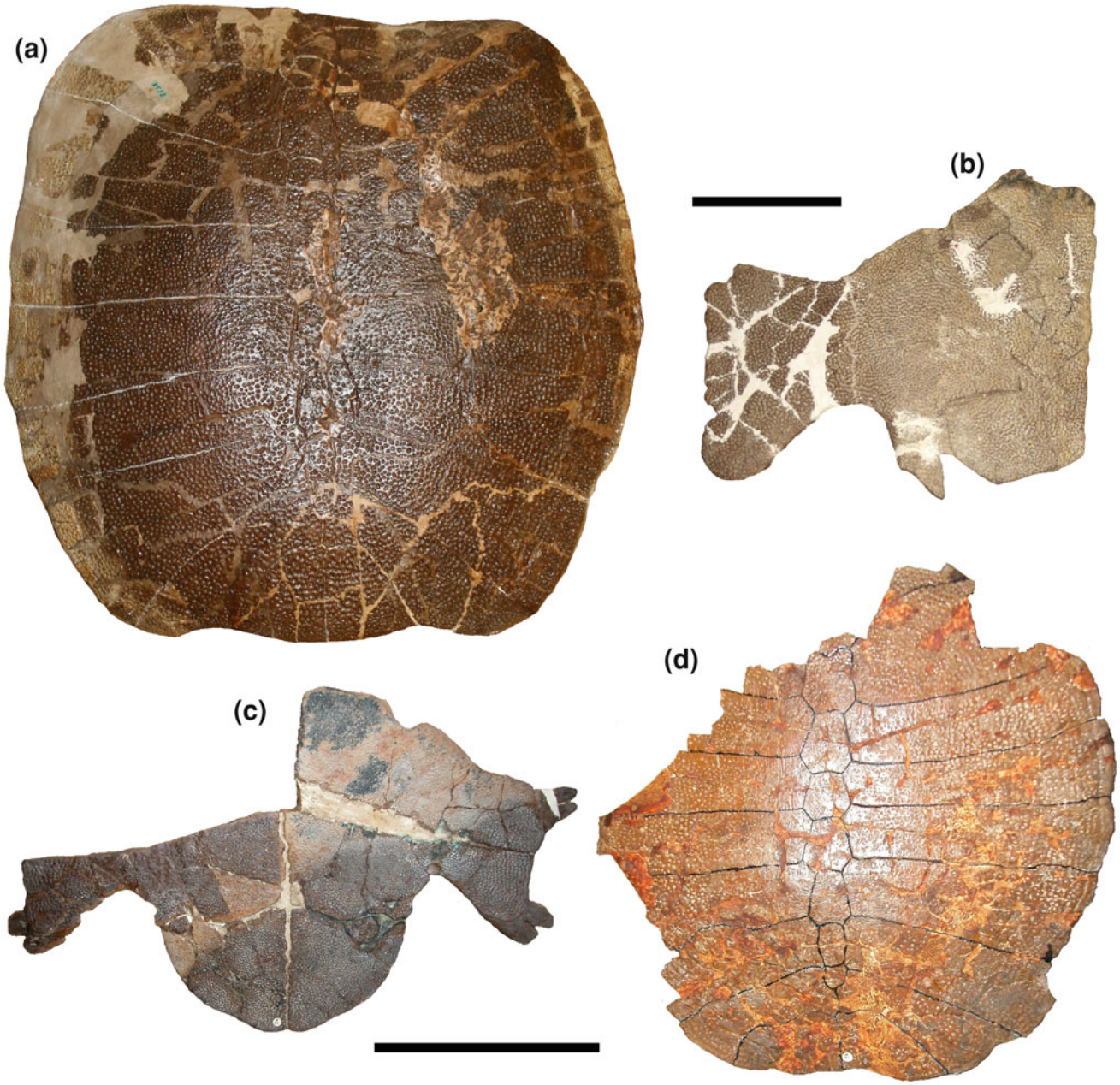


Fig. 20.15 *Aspideretoides* species. **a**, **b** *Aspideretoides robustus* (new combination), USNM 8538 (holotype), originally described as complete carapace and right hyoplastron + hypoplastron, but we regard only the carapace as the holotype (see text for discussion): **a** carapace, in dorsal view; **b** right hyoplastron + hypoplastron, in ventral view (we interpret these plastal plates as belonging to a different individual than the holotype carapace). **c** *Aspideretoides austerus*, PMU.R31, incomplete plastron consisting of right hypo- and xiphi-plastra and left hyo-, hypo-, and xiphi-plastra, in ventral view. **d** *Aspideretoides robustus* (new combination), PMU.R30, incomplete carapace, in dorsal view. Specimens at different magnifications; bar scales = 10 cm

plastral elements are much larger than would be expected if they had originated from the same individual as the carapace. Thus, we are of the opinion that Gilmore's (1919) holotype actually represents two individuals. Both the carapace and the hyo-hypoplastra have the same external surface sculpturing, so presumably they represent the same species. We have no evidence that they were collected from different localities, so we infer that the stratigraphic horizon and the geographic location are nearly the same for both components. We here restrict the holotype specimen to the carapace and designate the plastral elements (which retain the same institutional catalogue number as the carapace) as a referred specimen of the same species.

Another specimen (PMU.R31), consisting of the right hypoplastron and xiphiplastron, plus the left hyoplastron, hypoplastron and xiphiplastron, was described by Wiman

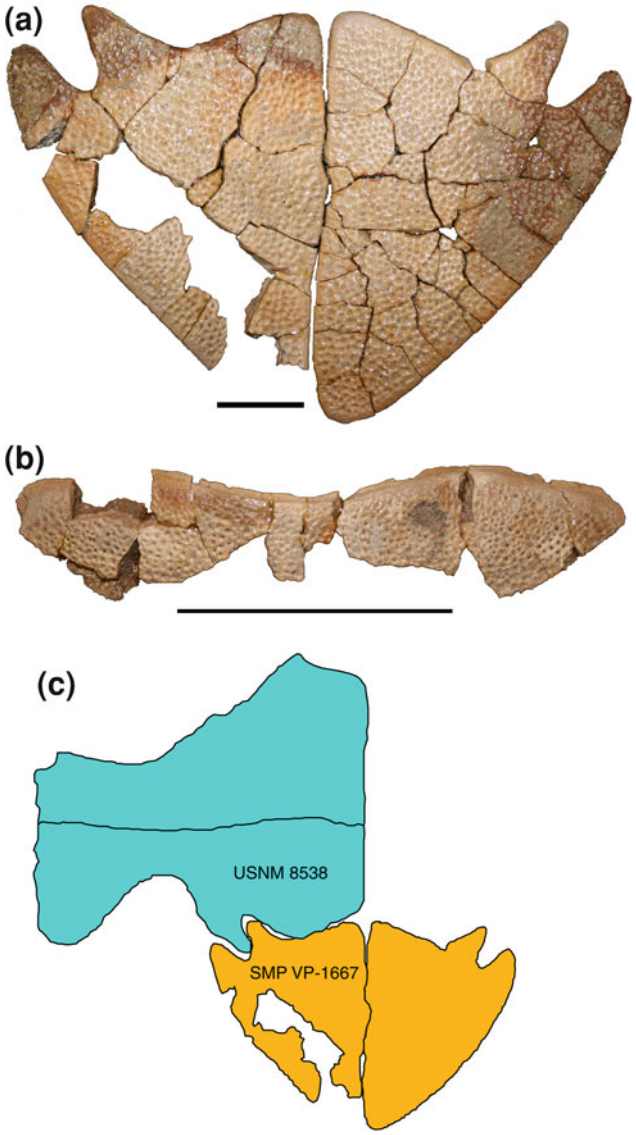


Fig. 20.16 *Aspideretoides robustus* (new combination) **a** SMP VP-1667, incomplete left and right xiphiplastra, in ventral view; **b** incomplete nuchal, in dorsal view; **c** *line* drawing of right hyoplastron + hypoplastron (part of USNM 8538 and originally designated as part of holotype) with right xiphiplastron (SMP VP-1667) showing conformity in the interlocking margins of the respective elements. Specimens at different magnifications; bar scales = 3 cm

(1933, p. 32) and assigned to *Plastomenus* sp. This specimen came from the "Ojo Alamo" beds, but based on its preservation it is almost certainly from the De-na-zin Member of the Kirtland Formation. PMU.R31 (Fig. 20.15c) differs from the hyoplastron + hypoplastron of USNM 8538 (Fig. 20.15b) in the following features: (1) the sutural contact uniting the hyoplastron and hypoplastron is directed anteriorly toward the midline; (2) the femoral notch is more constricted; and (3) the posterior border of the xiphiplastra is more rounded (compared to SMP VP-1667). Based on the morphological differences, and taking into account the different stratigraphic province of these two specimens, we considered PMU.R31 to be referable to *Aspideretoides austerus*. Consequently, *Aspideretoides robustus* is found with certainty only in the lower Kirtland Formation (Hunter Wash Member), whereas *A. austerus* is known only from the upper Kirtland Formation (De-na-zin Member). *Plastomenus* is no longer recognized in the Upper Cretaceous strata of New Mexico.

Confusion regarding the taxonomic status of *Plastomenus* has recently been reviewed by Joyce and Lyson (2010), who concluded that the type species of *Plastomenus* (*P. thomasii* [Cope 1872]) is a nomen dubium. However, in the interest of taxonomic stability, and following previous workers such as Gaffney (1979), they designated AMNH 6018 as the neotype of *Plastomenus thomasii* (Joyce and Lyson 2010). AMNH 6018 is from Grizzly Buttes, Wyoming, and is of Eocene (Bridgerian) age.

The xiphiplastron of AMNH 6018 (*Plastomenus thomasii*) differs from that of USNM 8538 (here referred to *Aspideretoides robustus*) in having a deep, narrow posterolateral margin; reduced lateral projection; and hyoplastron/hypoplastron border projecting anteriorly at the midline rather than nearly straight across (Hay 1908, Fig. 632). The sculpturing of *A. robustus* is similar to that of *A. austerus*, which differs from the sculpturing seen in specimens that are now identified as Plastomeninae (see account below for Plastomeninae Indet. and Appendix). We regard the two aforementioned species as distinct based on the characters of the hypoplastron and xiphiplastron described above, and we synonymize *Plastomenus robustus* with *Aspideretoides*, as the new combination *Aspideretoides robustus*.

Lastly, we note that Armstrong-Ziegler (1980) reported "*Trionyx* sp.", based on plastron and carapace fragments (MNA Pl. 1629), from the Fruitland Formation. Assuming she was correct in the identification of this material as trionychid, we infer this to be referable to *Aspideretoides* sp., and it is most likely referable to *A. robustus*. However, we have not seen the specimen, so we are unable to confirm this identification.

Gilmore (1935) named a new species "*Aspideretes*" *ovatus* and noted the following features: oval carapace with broadest portion anteriorly; posterior portion of carapace broadly pointed; carapace sculpturing "shallow, rounded pits, separated by ridges whose summits are flat topped," outer margins with parallel rows of pits, reduced seventh neural, preneural not evident, eighth pair of costals in contact on median line, seventh pair of costals separated by the seventh neural. Of those features, we regard only the following as possibly significant: (1) oval shape; (2) preneural apparently absent; and (3) seventh pair of costals separated by the seventh neural. However, among the 52 specimens from the Hunter Wash (Kirtland Formation) and Fossil Forest (Fruitland Formation) members, no other specimens of *A. ovatus* have been recognized. We note that "*A. ovatus*" is smaller then many of the coeval *A. robustus* specimens, suggesting that it may be a juvenile of the latter

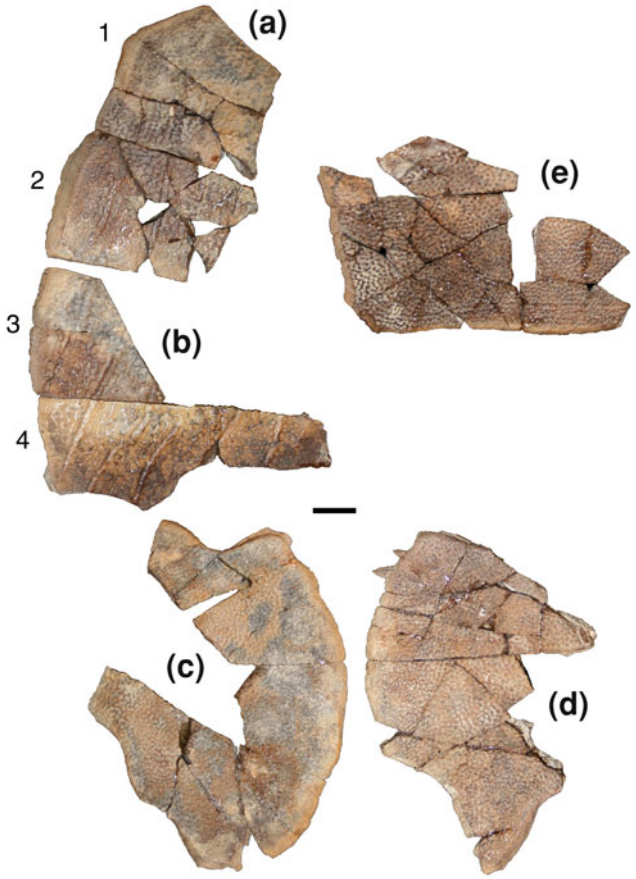


Fig. 20.17 Plastomeninae indeterminate; SMP VP-742, portions of carapace and plastron. **a** lateral portions of left costals *1* and *2*, in dorsal view; **b** lateral portions of left costals *3* and *4*, in dorsal view; **c** medial portions of right hyo- and hypo-plastra, in ventral view; **d** medial portions of left hyo- and hypo-plastra, in ventral view; **e** posterior margin of *left* side of carapace, in dorsal view. Bar scale = 1 cm

species. The apparent absence of the preneural may be the result of aberrant fusion of the first neural. Expansion of the posterior region (costals 6–8) laterally, as a consequence of ontogeny, would result in a more square-shape as seen in adult *A. robustus*. Concomitant with this lateral expansion posteriorly, the seventh pair of costals could contact posteriorly at the midline. Therefore, we do not believe *A. ovatus* is a valid species; instead, we suggest it is best regarded as a juvenile of *A. robustus*.

Aspideretoides sp.

Referred specimens: See Appendix for complete list of referred specimens.

Remarks: There are a number of trionychid specimens that are too fragmentary to be identified to species level. Presumably, based on stratigraphic parsimony, the majority of material from the upper Fruitland and the lower Kirtland formations is *Aspideretoides robustus*, whereas material from the upper Kirtland Formation is *A. austerus*, but this cannot be demonstrated. Many specimens from the Fruitland-Kirtland interval that have been previously assigned to *Plastomenus* are included here.

Plastomeninae indet.
(Fig. 20.17)

Referred specimens: See Appendix for complete list of referred specimens.

Occurrence: Within San Juan Basin, New Mexico, limited to the Hunter Wash Member of the Kirtland Formation; late Campanian (early Kirtlandian).

Remarks: SMP VP-742 (Fig. 20.17) consists of fragmentary sections of the carapace and plastron. The surface texture of both is very similar to that of *Compsemys*, consisting of fine tubercles that frequently fused together forming irregular strands. In places, they are enclosed, forming pits as in members of the Trionychidae. Elongated raised bands are prominently present on parts of the carapace sections. The lateral edges of SMP VP-742 lack peripherals, which is the reason for assigning it to the Trionychidae (Joyce et al. 2009). Characters cited by Joyce et al. (2009) that would allow assignment to the Plastomeninae are not readily recognizable. We note, however, that the sculpturing of the carapace is similar to some plastominine trionychids in having widely-spaced ridges that stretch obliquely across the carapace from the anterior midline region, posterolaterally.

Joyce et al. (2009, p. 322) reviewed the characterization of the clade Plastomeninae and concluded that an evenly rounded entoplastron was a better diagnostic character than the "higher degree of ossification of the plastron," a character that has been traditionally used for taxonomic discrimination in this group. However, they noted that the entoplastron is rarely preserved, making most specimens difficult to identify. Plastomenines are considered stem-cyclanorbines (Joyce et al. 2009; Joyce and Lyson 2010).

Biostratigraphy and Taxonomic Diversity

The rocks of the upper part of the Fruitland Formation (Fossil Forest Member) and the Kirtland Formation (Hunter Wash, Farmington and De-na-zin members) span approximately 2.0 my (Sullivan and Lucas 2003, 2006). The time represented by this depositional sequence is called the Kirtlandian land-vertebrate "age," which encompasses approximately 2.2 million years of late Campanian time (Sullivan and Lucas 2003, 2006). This interval coincides with the Bearpaw transgression and fills a gap between the classic Late Cretaceous Judithian and "Edmontonian" land-vertebrate ages. The fossil vertebrates, including turtles,

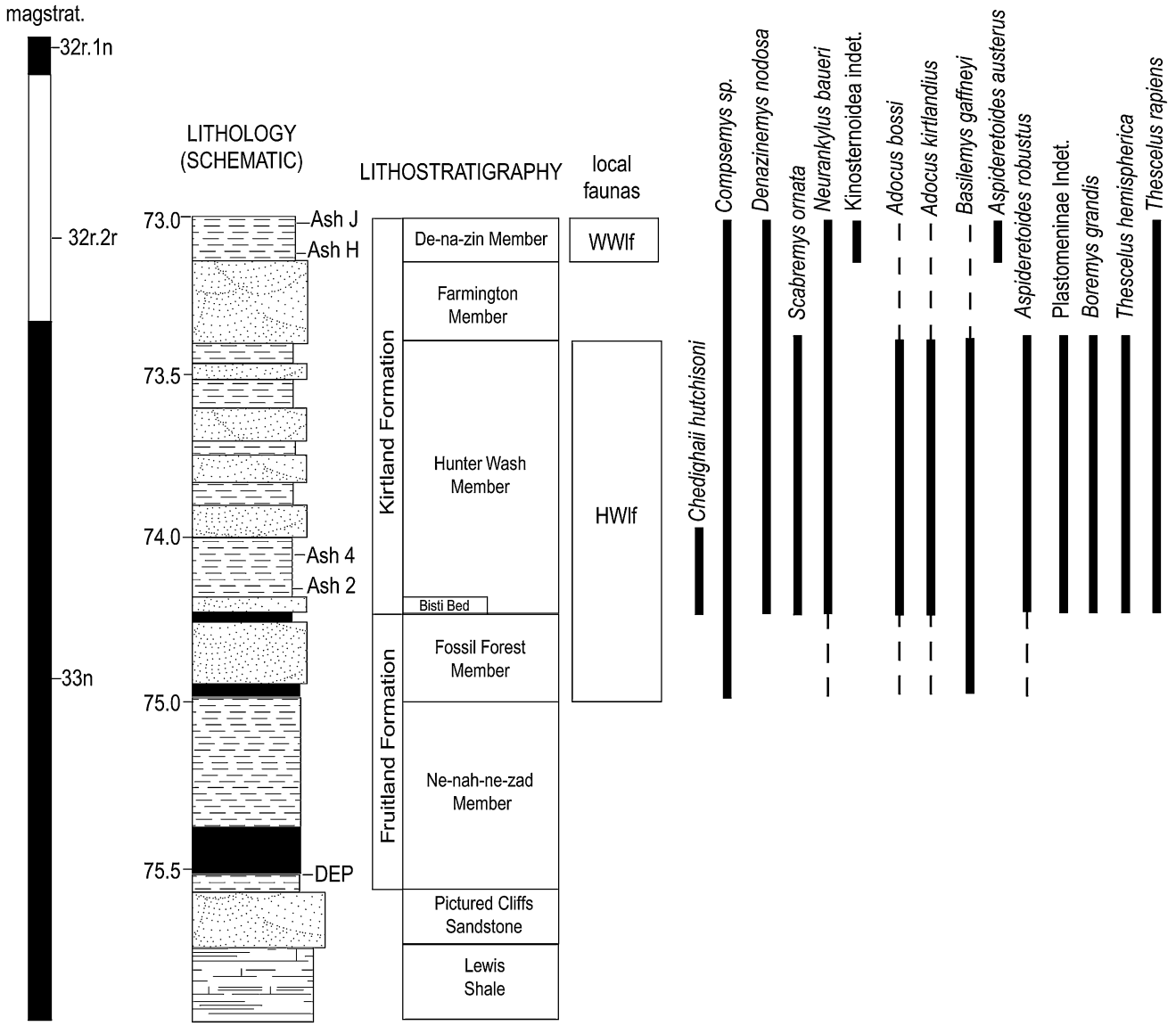


Fig. 20.18 Biostratigraphic distribution of turtles during the late Campanian through the Fruitland and Kirtland formations of the San Juan Basin, New Mexico, USA

which serve to characterize Kirtlandian time were revised by Sullivan and Lucas (2006). Here, we further refine what is known about the testudines from the upper part of the Fruitland and the Kirtland formations.

The turtles from the lower Kirtland Formation (Hunter Wash Member) are very similar to those reported from the Dinosaur Park Formation of Alberta (Brinkman 2005). Five genera are found in common: *Boremys*, *Adocus*, *Basilemys*, *Neurankylus*, and *Aspideretoides*. Both horizons yield an indeterminate plastomenine, but this record is questionable for the Dinosaur Park Formation (Brinkman 2005). The turtle taxa known from the Dinosaur Park Formation that are absent from the Kirtland Formation (both the Hunter Wash and De-na-zin members) include *Plesiobaena antiqua*, *Judithemys sukhanovi* Parham and Hutchison 2003, "*Apalone*" *latus* (Gilmore 1919), and Chelydridae gen. et sp. indet. Turtles that are present in the Fruitland and Kirtland formations, but absent from the Dinosaur Park Formation include: *Chedighaii hutchisoni* (restricted to the Fruitland Formation); *Scabremys ornata* (known with certainty only from the lower Kirtland Formation); *Compsemys* sp. (known throughout both the upper Fruitland and Kirtland formations); Kinosternoidea, gen. et sp. indet. (known only from the upper Kirtland Formation); *Thescelus hemispherica* (restricted to the lower Kirtland Formation); and *T. rapiens* (known throughout the entire Kirtland Formation). Differences in species among the genera shared by the Dinosaur Park Formation and the Fruitland/Kirtland

formations are interpreted by us to reflect largely temporal, rather than any latitudinal, differences. A summary of the stratigraphic distribution of the Fruitland-Kirtland turtles is presented in Fig. 20.18.

Our assessment of the stratigraphic distribution of turtles in the Upper Cretaceous rocks of the San Juan Basin differs from that reported by McCord (1996), who largely addressed only the distribution of genera and families which, in large part, is redundant because of the monogeneric nature of many of the turtle families. Thus, McCord (1996) listed only Baenidae, "*Baena*" *nodosa-ornata*, *Compsemys*, *Trionyx* Geoffroy St. Hilaire 1809, and *Adocus* from the Fruitland and the Kirtland formations. He also listed cf. *Basilemys*, *Hoplochelys* and *Plastomenus* as present in the overlying Naashoibito Member of the Ojo Alamo Formation (included in the Kirtland Formation by McCord 1996). McCord (1996, p. 147) then concluded that *Compsemys* is "known only from the Maastrichtian (Lancian) and later sediments" to argue that the Fruitland-Kirtland turtles "suggest a latest Cretaceous age." However, *Compsemys* has records as old as late Turonian (Eaton et al. 1999) and, as noted above, had been reported previously by Armstrong-Zeigler (1978) from the San Juan Basin. Indeed, the Fruitland-Kirtland turtle assemblage well resembles other late Campanian turtle assemblages (see above) and is not indicative of a Maastrichtian (or Lancian) age.

In a recent paper, Gates et al. (2010) provided a list of vertebrate taxa (including turtles) for the undivided Fruitland and Kirtland formations without regard to a more precise (member-level) stratigraphy. A number of taxa listed are in error and their precision with respect to biostratigraphic distribution is also not entirely correct. Thus, Gates et al. (2010) listed as present: *Compsemys victa*, *Boremys pulchra*, *Adocus lineolatus* Cope 1874, and *Basilemys variolosa*. None of these species are present in either the Fruitland or Kirtland formations. The taxon "*Denazinemys*" *ornata* (now *Scabremys ornata*) is known only from the lower Kirtland Formation, not the Fruitland and upper Kirtland formations, as listed by Gates et al. (2010). The taxon "*Plastomenus*" *robustus* (now *Aspideretoides robustus*) is known only from the Fruitland and the lower Kirtland formations, and not the upper Kirtland Formation as indicated by them (Gates et al. 2010). The genus *Thescelus* is clearly present, represented by the species *T. hemispherica*, from the Hunter Wash Member (Kirtland Formation) and *T. rapiens*, from both the Hunter Wash and De-na-zin members of the Kirtland Formation, contrary to its absence reported by Gates et al. (2010). *Neurankylus eximius* is not known from the Fruitland Formation (Sullivan and Lucas 2006) and its identification in this unit is probably due to the synonymy of Gaffney (1972). The "kinosternid n. sp." listed by Gates et al. (2010) for the Kaiparowits and the Fruitland/Kirtland ("KF" of Gates et al. 2010, Appendix 1) are not the same taxon (Hutchison 2010, pers. comm.). These misidentifications and lack of tighter stratigraphic precision based on turtle taxa, call into question the reliability of the rest of the fauna list complied by Gates et al. (2010, Appendix 1).

The biostratigraphic distribution of turtles from the Fruitland and Kirtland formations is relatively useful. Many turtle specimens formerly considered from the Fruitland Formation are now thought to be from the lower Kirtland Formation based on the revised stratigraphy of Brown (1983). Even so, the upper Fruitland (Fossil Forest Member) and lower Kirtland (Hunter Wash Member) formations' vertebrates make up a single local fauna (Hunter Wash local fauna) (Sullivan and Lucas 2006). The vertebrates from the upper Kirtland Formation (De-na-zin Member) are part of the Willow Wash local fauna, and have been shown to be different from those found stratigraphically lower (Sullivan and Lucas 2006). Indeed, turtles from the Willow Wash local fauna differ from those of the Hunter Wash local fauna (Fig. 20.18).

The baenids *Boremys grandis*, *Denazinemys nodosa*, *Neurankylus baueri*, *Scabremys ornata*, *Thescelus hemispherica*, and *T. rapiens* are all present in the Hunter Wash local fauna (HWlf). The bothremydid *Chedighaii hutchisoni*, the adocids *Adocus bossi* and *A. kirtlandius*, the nanhsiungchelyid *Basilemys gaffneyi*, the trionychids *Aspideretoides robustus* and an indeterminate plastomenine are also present in the HWlf. *Compsemys* is known throughout the entire Kirtlandian interval. Previously, *Trionyx* and *Plastomenus* had been reported from the Fruitland and Kirtland formations (Armstrong-Ziegler 1978; Gilmore 1919; McCord 1996), but these taxa most certainly are either *Aspideretoides* or an indeterminate trionychid.

The baenids *Denazinemys nodosa*, *Neurankylus eximius*, and *Thescelus rapiens* are present in the Willow Wash local fauna (WWlf). An indeterminate kinosternoid, probably representing a new genus and species, and similar or identical to the one reported from the Cerro del Pueblo Formation, Mexico, is also present in the WWlf. Only one trionychid, *Aspideretoides austerus*, is present. Turtle genera representing the adocid *Adocus* and the nanhsiungchelyid *Basilemys* are also present, but are presently not identifiable to species level. A summary of turtle distribution for the Hunter Wash and Willow Wash local faunas is presented in Fig. 20.18.

On the face of it, the Hunter Wash local fauna has a higher diversity of turtle taxa, whereas the Willow Wash local fauna has considerably fewer taxa (Fig. 20.18). This apparent decrease in diversity could be attributed to a sampling of different paleoenvironments. The stratum (De-na-zin Member) that contains the Willow Wash local fauna is fossiliferous and

has a more prominent terrestrial component represented mostly by dinosaurs. In contrast, the Hunter Wash local fauna, arguably, has a stronger aquatic component. This may be attributed to the fact that fishes and turtles are more common in the HWlf. Furthermore, the HWlf is derived from a much thicker stratigraphic section that is much more widely exposed than the rocks that yield the WWlf—this also may account for the greater diversity of turtles in the HWlf.

Non-marine Late Cretaceous turtle distribution and paleobiogeography have been discussed by Hirayama et al. (2000), Holroyd and Hutchison (2002), and Brinkman (2005). Attempts at assessing the relative abundance of taxa within geographically-limited regions have been discussed in detail by Holroyd and Hutchison (2002). Of particular interest is the idea that different temporal time spans produce different abundances or numbers of taxa. The upper Fruitland and Kirtland formations represent an ideal stratigraphic sequence to study temporal differences. These two formations have been interpreted to represent a relatively continuous depositional sequence, beginning with delta plain deposits (Fruitland-lower Kirtland) overlain by more inland river and floodplain deposits that prograde over the coastal deltas and swamps as the shoreline prograded to the northeast (Fassett and Hinds 1971; Lucas 1981; Lucas and Mateer 1983). This took place during approximately 2 million years of late Campanian time.

With the epicontinental seaway retreating to the east/northeast, there was a decrease in the near-shore aquatic realm concomitant with an increase in the terrestrial realm. The shift in the near-shore environment eastward no doubt resulted in the reduction of large channels, together with a corresponding increase in terrestrial expanses between riparian regions, a factor noted by Brinkman (2003) in the decrease in taxonomic diversity of turtles during the Late Cretaceous of Alberta. Although terrestrial taxa, such as *Basilemys*, might be expected to have been more common in a more terrestrial-dominated sequence, their relative rarity may reflect dwindling numbers of individuals locally, although Bryant (1989) thought that their rarity was attributed to the presence of habitats away from streams. We note that specimens of the Plastomeninae are rare (as is the case in the Dinosaur Park Formation) and that the genus *Aspideretoides* is common and present throughout the Fruitland and Kirtland formations (Brinkman 2005). Brinkman (2005) noted that *Aspideretoides splendidus* was restricted to the upper part of the Dinosaur Park Formation, and not found in the lower part of the formation or in the Oldman Formation below that. He inferred that *A. splendidus* preferred a more coastal environment (Brinkman 2005). Similar preferences for a coastal environment may be recognized for the stratigraphically younger *A. robustus*, known only from the lower Kirtland Formation (Hunter Wash Member). With respect to the other turtle taxa, there is clearly an apparent decrease in the number taxa from the lower Kirtland, to the upper Kirtland, which may be environment related.

Brinkman (2005) noted the role of latitudinal differences in affecting the geographic distribution and stratigraphic presence of turtles as well as factors such as a low tolerance to salinity and climate. However, we are struck by the generic similarity between the higher latitudinal Dinosaur Park Formation and the lower latitudinal Fruitland/Kirtland formations. Differences among species of the shared genera are more likely to be temporal rather than geographic, assuming similar temperatures and salinity.

In summary, turtle species diversity is greater for the Hunter Wash local fauna than it is for the Willow Wash local fauna. While many of the same genera are found in both local faunas, there are fewer genera known from the WWlf (see Fig. 20.18). This most likely reflects an environmental shift from a delta plain with numerous streams, channels and swamps, to that of a more upland landscape. This decreased turtle diversity during the Late Cretaceous in the San Juan Basin is consistent with patterns of decreasing turtle diversity elsewhere in North America during this time interval (Brinkman 2003).

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Appendix

List of all known previously referred, and newly referred, turtle specimens from the Fruitland and Kirtland formations, as of 2010. Order is alphabetic by (1) family/higher taxonomic category, (2) genus, (3) species, and (4) institution.

Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
USNM 8577		Adocidae	*Adocus*	*bossi*	paratype		Kirtland	Hunter Wash	partial carapace & plastron
USNM 8613		Adocidae	*Adocus*	*bossi*	holotype		Kirtland	Hunter Wash	partial carapace & nearly complete plastron
USNM 11082		Adocidae	*Adocus*	*bossi*			Kirtland	De-na-zin	carapace & plastron
USNM 11326		Adocidae	*Adocus*	*bossi*			Kirtland	Hunter Wash	incomplete carapace & plastron
USNM 12838		Adocidae	*Adocus*	*bossi*			Kirtland	Hunter Wash	carapace & plastron
USNM 12842		Adocidae	*Adocus*	*bossi*			Kirtland	Hunter Wash	carapace & plastron
USNM 12982		Adocidae	*Adocus*	*bossi*			Kirtland	Hunter Wash	carapace & plastron
USNM 12983		Adocidae	*Adocus*	*bossi*			Kirtland	Hunter Wash	carapace, plastron, & pelvis
USNM 8593		Adocidae	*Adocus*	*kirtlandius*	holotype		Kirtland	Hunter Wash	incomplete carapace & plastron
SMP VP-1725		Adocidae	*Adocus*	sp		313a	Kirtland	De-na-zin	carapace fragments
SMP VP-1280		Adocidae	*Adocus*	sp.		313a	Kirtland	De-na-zin	carapace & plastron fragments
SMP VP-1295		Adocidae	*Adocus*	sp.		350	Kirtland	De-na-zin	carapace & plastron fragments
SMP VP-1328		Adocidae	*Adocus*	sp.		386	Kirtland	Hunter Wash	peripheral carapace fragment
SMP VP-1330		Adocidae	*Adocus*	sp.		385	Kirtland	Hunter Wash	part of right carapace with peripherals & fragments
SMP VP-1331		Adocidae	*Adocus*	sp.		385	Kirtland	Hunter Wash	carapace/bridge fragment
SMP VP-1346		Adocidae	*Adocus*	sp.		373	Kirtland	Hunter Wash	carapace fragment with part of bridge
SMP VP-1350		Adocidae	*Adocus*	sp.		373	Kirtland	Hunter Wash	nuchal & anterior carapace fragments
SMP VP-1417		Adocidae	*Adocus*	sp.		388a	Kirtland	De-na-zin	carapace fragments
SMP VP-1482		Adocidae	*Adocus*	sp.		281	Kirtland	Hunter Wash	plastron & other fragments
SMP VP-1502		Adocidae	*Adocus*	sp.		283	Kirtland	Hunter Wash	carapace fragments
SMP VP-1504		Adocidae	*Adocus*	sp.		282	Kirtland	Hunter Wash	costals
SMP VP-1523		Adocidae	*Adocus*	sp.		281	Kirtland	Hunter Wash	peripheral of carapace
SMP VP-1544		Adocidae	*Adocus*	sp.		372	Kirtland	Hunter Wash	carapace fragment
SMP VP-1660		Adocidae	*Adocus*	sp.		283	Kirtland	Hunter Wash	carapace & plastron fragments
SMP VP-2032		Adocidae	*Adocus*	sp.		421	Kirtland	Hunter Wash	part of carapace
SMP VP-2033		Adocidae	*Adocus*	sp.		421	Kirtland	Hunter Wash	carapace fragments

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
SMP VP-2361		Adocidae	*Adocus*	sp.		451	Kirtland	Hunter Wash	carapace fragments & incomplete limb bone
SMP VP-2438		Adocidae	*Adocus*	sp.		435	Kirtland	Hunter Wash	carapace fragment
SMP VP-2439		Adocidae	*Adocus*	sp.		435	Kirtland	Hunter Wash	neural & other carapace fragments
SMP VP-2602		Adocidae	*Adocus*	sp.		319a	Kirtland	De-na-zin	two carapace fragments
SMP VP-2616		Adocidae	*Adocus*	sp.		319a	Kirtland	De-na-zin	carapace fragment
SMP VP-2818		Adocidae	*Adocus*	sp.		228	Kirtland	Hunter Wash	carapace neural
SMP VP-3264		Adocidae	*Adocus*	sp.		228	Kirtland	Hunter Wash	carapace fragments
SMP VP-3275		Adocidae	*Adocus*	sp.		463	Fruitland	Fossil Forest	carapace fragments
NMMNH P-22621		Adocidae	*Adocus*	sp.		1636	Kirtland	Hunter Wash	incomplete nuchal
NMMNH P-22700		Adocidae	*Adocus*	sp.		1623	Kirtland/ Fruitland	unknown	6 carapace fragments
NMMNH P-22709		Adocidae	*Adocus*	sp.		1649	Kirtland	Hunter Wash	2 carapace fragments
NMMNH P-22747		Adocidae	*Adocus*	sp.		1674	Fruitland	Fossil Forest	carapace/plastron fragments
NMMNH P-26225		Adocidae	*Adocus*	sp.		3227	Kirtland	De-na-zin	incomplete neural
NMMNH P-26258		Adocidae	*Adocus*	sp.		3243	Kirtland	De-na-zin	carapace fragment
NMMNH P-26262		Adocidae	*Adocus*	sp.		3245	Kirtland	De-na-zin	incomplete costal
NMMNH P-27427		Adocidae	*Adocus*	sp.		1708	Kirtland	Hunter Wash	numerous shell fragments
NMMNH P-27463		Adocidae	*Adocus*	sp.		3875	Kirtland	Hunter Wash	23 carapace/plastron fragments
NMMNH P-27601		Adocidae	*Adocus*	sp.		4015	Fruitland	Fossil Forest	carapace/plastron fragments
NMMNH P-27629		Adocidae	*Adocus*	sp.		4015	Fruitland	Fossil Forest	carapace fragments
NMMNH P-27760		Adocidae	*Adocus*	sp.		4015	Fruitland	Fossil Forest	carapace/plastron fragments
NMMNH P-27774		Adocidae	*Adocus*	sp.		4015	Fruitland	Fossil Forest	carapace fragments & neural
NMMNH P-27926		Adocidae	*Adocus*	sp.		1688	Kirtland	Hunter Wash	shell fragments
NMMNH P-30759		Adocidae	*Adocus*	sp.		3117	Kirtland	Hunter Wash	miscellaneous shell fragments
NMMNH P-32871		Adocidae	*Adocus*	sp.		2387	Fruitland	Fossil Forest	6 shell fragments
NMMNH P-32964		Adocidae	*Adocus*	sp.		2387	Fruitland	Fossil Forest	13 fragments
NMMNH P-38403		Adocidae	*Adocus*	sp.		4010	Fruitland	Fossil Forest	entoplaston
NMMNH P-41022		Adocidae	*Adocus*	sp.		5400	Kirtland	De-na-zin	carapace fragments
NMMNH P-41023		Adocidae	*Adocus*	sp.		5400	Kirtland	De-na-zin	15 carapace/plastron fragments

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
NMMNH P-49867	UA 5572	Adocidae	*Adocus*	sp.		6203	Fruitland?	Fossil Forest?	nearly complete plastron
NMMNH P-22537		Adocidae	*Adocus*	sp.		1582	Kirtland	Hunter Wash	shell fragment
NMMNH P-22543		Adocidae	*Adocus*	sp.		1584	Kirtland	Hunter Wash	shell fragment
NMMNH P-22652		Adocidae	*Adocus*	sp.		1672	Fruitland	Fossil Forest	3 shell fragments
NMMNH P-22653		Adocidae	*Adocus*	sp.		1672	Fruitland	Fossil Forest	shell fragment
NMMNH P-22733		Adocidae	*Adocus*	sp.		1668	Kirtland	Hunter Wash	shell fragments
NMMNH P-22740		Adocidae	*Adocus*	sp.		1674	Fruitland	Fossil Forest	carapace fragments
NMMNH P-22750		Adocidae	*Adocus*	sp.		1674	Fruitland	Fossil Forest	incomplete costals
NMMNH P-22822		Adocidae	*Adocus*	sp.		1706	Fruitland	Fossil Forest	2 shell fragments
NMMNH P-27883		Adocidae	*Adocus*	sp.		3227	Kirtland	De-na-zin	costal, plastron, peripheral, & other fragments
NMMNH P-28327		Adocidae	*Adocus*	sp.		1882	Fruitland	Fossil Forest	2 carapace fragments
NMMNH P-30069		Adocidae	*Adocus*	sp.		4267	Fruitland	Fossil Forest	numerous shell fragments
NMMNH P-30361		Adocidae	*Adocus*	sp.		3490	Kirtland	Hunter Wash	numerous carapace/plastron fragments
NMMNH P-32850		Adocidae	*Adocus*	sp.		4544	Fruitland	Fossil Forest	14 costal fragments
NMMNH P-49724	UA 13483	Adocidae	*Adocus*	sp.		6333	Kirtland?	Hunter Wash?	shell fragment
NMMNH P-49725	UA 14413	Adocidae	*Adocus*	sp.		6333	Kirtland?	Hunter Wash?	4 shell fragments
NMMNH P-49826	UA 14404	Adocidae	*Adocus*	sp.		6559	Kirtland?	Hunter Wash?	2 shell fragments
NMMNH P-49831	UA 14411	Adocidae	*Adocus*	sp.		6622	Kirtland?	De-na-zin?	shell fragment
NMMNH P-49849	UA 14402	Adocidae	*Adocus*	sp.		6547	Kirtland?	Hunter Wash?	2 shell fragments
NMMNH P-49851	UA 14405	Adocidae	*Adocus*	sp.		6551	Kirtland?	De-na-zin?	carapace fragment
NMMNH P-49854	UA 14401	Adocidae	*Adocus*	sp.		6552	Kirtland?	De-na-zin?	shell fragment
NMMNH P-49859	UA 14403	Adocidae	*Adocus*	sp.		6558	Kirtland?	Hunter Wash?	2 shell fragments
NMMNH P-49866	UA 5575	Adocidae	*Adocus*	sp.		6203	Fruitland?	Fossil Forest?	plastron & carapace fragments
NMMNH P-49895	UA 14406	Adocidae	*Adocus*	sp.		6542	Kirtland?	Hunter Wash?	shell fragment
NMMNH P-49926	UA 8559	Adocidae	*Adocus*	sp.		6272	Kirtland?	Hunter Wash?	shell fragment

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
NMMNH P-49927	UA 8560	Adocidae	*Adocus*	sp.		6272	Kirtland?	Hunter Wash?	shell fragment
NMMNH P-50625	UA 14407	Adocidae	*Adocus*	sp.		6558	Kirtland?	Hunter Wash?	shell fragment
NMMNH P-49846	UA 14426	Adocidae	*Adocus*	sp.		6544	Kirtland?	Hunter Wash?	2 shell fragment
USNM 8654		Adocidae	*Adocus*	sp.			Kirtland	Hunter Wash	partial plastron
SMP VP-1098		Adocidae	cf. *Adocus*	sp.		361	Kirtland	De-na-zin	carapace & plastron fragments
SMP VP-1294		Adocidae	cf. *Adocus*	sp.		372	Kirtland	Hunter Wash	carapace & plastron fragments from multiple individuals
SMP VP-1477		Adocidae	cf. *Adocus*	sp.		365	Kirtland	Hunter Wash	carapace fragment
SMP VP-1666		Adocidae	cf. *Adocus*	sp.		398	Kirtland	Hunter Wash	carapace & plastron fragments
SMP VP-1843		Adocidae	cf. *Adocus*	sp.		319a	Kirtland	De-na-zin	plastron fragment
SMP VP-2096		Adocidae	cf. *Adocus*	sp.		389a	Kirtland	De-na-zin	incomplete plastron
SMP VP-2382		Adocidae	cf. *Adocus*	sp.		382	Kirtland	De-na-zin	carapace fragment
SMP VP-2578		Adocidae	cf. *Adocus*	sp.		450	Fruitland	Fossil Forest	neural
SMP VP-2841		Adocidae	cf. *Adocus*	sp.		450	Fruitland	Fossil Forest	carapace fragment & associated indeterminate bone material
SMP VP-2856		Adocidae	cf. *Adocus*	sp.		450	Fruitland	Fossil Forest	incomplete costal & other carapace fragments
NMMNH P-28322		Adocidae	cf. *Adocus*	sp.		1882	Fruitland	Fossil Forest	numerous carapace fragments
NMMNH P-44902		Adocidae	cf. *Adocus*	sp.		3517	Kirtland	Hunter Wash	carapace fragments
NMMNH P-22756		Adocidae	?*Adocus*	sp.		1678	Fruitland	Fossil Forest	various shell fragments
NMMNH P-27781		Adocidae	?*Adocus*	sp.		4015	Fruitland	Fossil Forest	numerous carapace/plastron fragments
SMP VP-1444		Adocidae	?*Adocus*	sp.		281	Kirtland	Hunter Wash	fragments of carapace
SMP VP-1956		Adocidae	?*Adocus*	sp.		382	Kirtland	De-na-zin	neural
SMP VP-2018		Adocidae	?*Adocus*	sp.		420a	Kirtland	De-na-zin	plastron fragment
SMP VP-2491		Adocidae	?*Adocus*	sp.		389a	Kirtland	De-na-zin	carapace fragment
SMP VP-2802		Adocidae	?*Adocus*	sp.		450	Fruitland	Fossil Forest	costal, marginal, & other carapace fragments

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
USNM 12979		Baenidae	*Boremys*	*grandis*	holotype		Kirtland	De-na-zin	carapace & plastron
USNM 12978		Baenidae	*Boremys*	sp.			Kirtland	Hunter Wash?	partial carapace & plastron
SMP VP-1565		Baenidae	cf. *Boremys*	sp.		391	Kirtland	Hunter Wash	plastron fragment
FMNH PR-2250		Baenidae	*Denazinemys*	*nodosa*			Kirtland	Hunter Wash	nearly complete carapace & plastron
NMMNH P-22564		Baenidae	*Denazinemys*	*nodosa*		1602	Kirtland	Farmington	2 carapace fragments
NMMNH P-22716		Baenidae	*Denazinemys*	*nodosa*		1654	Kirtland	Hunter Wash	2 shell fragments
NMMNH P-22790		Baenidae	*Denazinemys*	*nodosa*		1696	Fruitland	Fossil Forest	numerous shell fragments
NMMNH P-22881		Baenidae	*Denazinemys*	*nodosa*		1755	Kirtland	Hunter Wash	numerous carapace & bone fragments
NMMNH P-25075		Baenidae	*Denazinemys*	*nodosa*		1674	Fruitland	Fossil Forest	nearly complete
NMMNH P-25087		Baenidae	*Denazinemys*	*nodosa*		3117	Kirtland	Hunter Wash	complete carapace & plastron
NMMNH P-27732		Baenidae	*Denazinemys*	*nodosa*		4015	Fruitland	Fossil Forest	carapace fragments
NMMNH P-27830		Baenidae	*Denazinemys*	*nodosa*		4015	Fruitland	Fossil Forest	partial carapace & plastron
NMMNH P-32890		Baenidae	*Denazinemys*	*nodosa*		4010	Kirtland	Hunter Wash	incomplete carapace & fragments
NMMNH P-37763		Baenidae	*Denazinemys*	*nodosa*		5163	Kirtland	Hunter Wash	numerous carapace & plastron fragments
NMMNH P-39633		Baenidae	*Denazinemys*	*nodosa*		4275	Kirtland	Hunter Wash	numerous carapace & plastron fragments
NMMNH P-49858	UA 14394	Baenidae	*Denazinemys*	*nodosa*		6558	Kirtland?	Hunter Wash?	shell fragment
NMMNH P-49896	UA 8826	Baenidae	*Denazinemys*	*nodosa*		6539	Kirtland?	Hunter Wash?	carapace fragment
NMMNH P-26254		Baenidae	*Denazinemys*	*nodosa*		3226	Kirtland	De-na-zin	carapace fragment
NMMNH P-26255		Baenidae	*Denazinemys*	*nodosa*		3226	Kirtland	De-na-zin	carapace fragment
NMMNH P-26298		Baenidae	*Denazinemys*	*nodosa*		3169	Kirtland	De-na-zin	numerous carapace fragments
NMMNH P-27278		Baenidae	*Denazinemys*	*nodosa*		3530	Kirtland	De-na-zin	2 carapace fragments
NMMNH P-27439		Baenidae	*Denazinemys*	*nodosa*		3531	Kirtland	De-na-zin	neural part of carapace
NMMNH P-33026		Baenidae	*Denazinemys*	*nodosa*		4275	Kirtland	Hunter Wash	12 carapace fragments
NMMNH P-33028		Baenidae	*Denazinemys*	*nodosa*		4275	Kirtland	Hunter Wash	neural fragment
NMMNH P-41229		Baenidae	*Denazinemys*	*nodosa*		3506	Kirtland	Hunter Wash	nearly complete carapace & plastron

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
NMMNH P-22636		Baenidae	*Denazinemys*	*nodosa*		1640	Kirtland	Hunter Wash	carapace fragments
NMMNH P-22643		Baenidae	*Denazinemys*	*nodosa*		1606	Fruitland	Fossil Forest	carapace fragments
NMMNH P-28323		Baenidae	*Denazinemys*	*nodosa*		1882	Fruitland	Fossil Forest	numerous carapace fragments
NMMNH P-32867		Baenidae	*Denazinemys*	*nodosa*		2387	Fruitland	Fossil Forest	5 carapace fragments
PMU.R 11	Exemplar 1	Baenidae	*Denazinemys*	*nodosa*			Kirtland	Hunter Wash	carapace, plastron, pelvis, & other postcrania
PMU.R 12	Exemplar 2	Baenidae	*Denazinemys*	*nodosa*			Kirtland	De-na-zin	nearly complete carapace & plastron
PMU.R 13	Exemplar 3	Baenidae	*Denazinemys*	*nodosa*			Kirtland	Hunter Wash	incomplete carapace & [plastron
PMU.R 14	Exemplar 4	Baenidae	*Denazinemys*	*nodosa*			Kirtland	Hunter Wash	incomplete carapace & plastron
PMU.R unnumbered	Exemplar 5	Baenidae	*Denazinemys*	*nodosa*			unknown	unknown	incomplete carapace & plastron
PMU.R unnumbered	Exemplar 6	Baenidae	*Denazinemys*	*nodosa*			Kirtland	De-na-zin	incomplete carapace & plastron
PMU.R 15	Exemplar 7	Baenidae	*Denazinemys*	*nodosa*			unknown	unknown	incomplete carapace
PMU.R unnumbered	Exemplar 8	Baenidae	*Denazinemys*	*nodosa*			Kirtland	De-na-zin	incomplete plastron & other shell material
PMU.R 16	Exemplar 9	Baenidae	*Denazinemys*	*nodosa*			Kirtland	Hunter Wash	incomplete carapace
PMU.R 17	Exemplar 10	Baenidae	*Denazinemys*	*nodosa*			Kirtland	Hunter Wash	incomplete carapace & nearly complete plastron
PMU.R 18	Exemplar 11	Baenidae	*Denazinemys*	*nodosa*			Kirtland	Hunter Wash	nearly complete carapace & plastron
PMU.R 19	Exemplar 12	Baenidae	*Denazinemys*	*nodosa*			Kirtland	Hunter Wash	incomplete plastron
PMU.R 20	Exemplar 13	Baenidae	*Denazinemys*	*nodosa*			unknown	unknown	incomplete carapace & plastron
PMU.R unnumbered	Exemplar 14	Baenidae	*Denazinemys*	*nodosa*			unknown	unknown	shell fragments
PMU.R unnumbered	Exemplar 15	Baenidae	*Denazinemys*	*nodosa*			Kirtland	Hunter Wash	carapace & plastron fragments
PMU.R unnumbered	Exemplar 16	Baenidae	*Denazinemys*	*nodosa*			Kirtland	Hunter Wash	carapace fragments
PMU.R unnumbered	Exemplar 17	Baenidae	*Denazinemys*	*nodosa*			Kirtland	Hunter Wash	shell fragments
SMP VP-1284		Baenidae	*Denazinemys*	*nodosa*		350	Kirtland	De-na-zin	?carapace fragment
SMP VP-1287		Baenidae	*Denazinemys*	*nodosa*		350	Kirtland	De-na-zin	numerous plastron & carapace fragments

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
SMP VP-1290		Baenidae	*Denazinemys*	*nodosa*		360a	Kirtland	De-na-zin	carapace fragments
SMP VP-1323		Baenidae	*Denazinemys*	*nodosa*		319a	Kirtland	De-na-zin	carapace fragment
SMP VP-1403		Baenidae	*Denazinemys*	*nodosa*		388a	Kirtland	De-na-zin	carapace & associated fragments
SMP VP-1869		Baenidae	*Denazinemys*	*nodosa*		382	Kirtland	De-na-zin	complete carapace & plastron
SMP VP-2072		Baenidae	*Denazinemys*	*nodosa*		376a	Kirtland	De-na-zin	nearly complete carapace & plaston
SMP VP-2495		Baenidae	*Denazinemys*	*nodosa*		389a	Kirtland	De-na-zin	carapace fragment
SMP VP-830		Baenidae	*Denazinemys*	*nodosa*		316	Kirtland	Hunter Wash	incomplete plastron with left bridge & numerous carapace fragments
SMP VP-1348		Baenidae	*Denazinemys*	*nodosa*		373	Kirtland	Hunter Wash	carapace fragments
SMP VP-1469		Baenidae	*Denazinemys*	*nodosa*		228	Kirtland	Hunter Wash	anterior part of plastron (intergular, gular, & humeral)
SMP VP-1480		Baenidae	*Denazinemys*	*nodosa*		281	Kirtland	Hunter Wash	carapace fragment
SMP VP-1506		Baenidae	*Denazinemys*	*nodosa*		228	Kirtland	Hunter Wash	right plastron fragment (intergular, gular, & humeral)
SMP VP-1524		Baenidae	*Denazinemys*	*nodosa*		281	Kirtland	Hunter Wash	carapace fragment
SMP VP-1665		Baenidae	*Denazinemys*	*nodosa*		398	Kirtland	Hunter Wash	medial part of carapace
SMP VP-1668		Baenidae	*Denazinemys*	*nodosa*		398	Kirtland	Hunter Wash	complete plastron, partial carapace, & fragments
SMP VP-1948		Baenidae	*Denazinemys*	*nodosa*		228	Kirtland	Hunter Wash	four carapace fragments
SMP VP-1986		Baenidae	*Denazinemys*	*nodosa*		419	Kirtland	Hunter Wash	incomplete plastron & carapace
SMP VP-2529		Baenidae	*Denazinemys*	*nodosa*		452	Kirtland	Hunter Wash	carapace fragment
SMP VP-2828		Baenidae	*Denazinemys*	*nodosa*		349	Kirtland	Hunter Wash	incomplete plastron
SMP VP-3255		Baenidae	*Denazinemys*	*nodosa*		398	Kirtland	Hunter Wash	plastron fragment, including part of xiphiplastron & bridge
USNM 8345		Baenidae	*Denazinemys*	*nodosa*	holotype		Kirtland	De-na-zin	carapace & plastron
USNM 8603		Baenidae	*Denazinemys*	*nodosa*			Kirtland	Hunter Wash	median part of carapace
USNM 8622		Baenidae	*Denazinemys*	*nodosa*			Fruitland	Fossil Forest	median part of carapace
USNM 11323		Baenidae	*Denazinemys*	*nodosa*			Kirtland	Hunter Wash	carapace & plastron

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
USNM 11327		Baenidae	*Denazinemys*	*nodosa*			Fruitland	Fossil Forest	crushed shell
USNM 12819		Baenidae	*Denazinemys*	*nodosa*			Kirtland	Hunter Wash	carapace & incomplete plastron
USNM 12834		Baenidae	*Denazinemys*	*nodosa*			Kirtland	De-na-zin	incomplete carapace & plastron
NMMNH P-49945	UA 5573	Baenidae	cf. *Denazinemys*	*nodosa*		6205	Kirtland?	Hunter Wash?	10 plastron & associated fragments
SMP VP-1704		Baenidae	cf. *Denazinemys*	*nodosa*		409	Kirtland	Hunter Wash	partial carapace & plastron
SMP VP-2853		Baenidae	cf. *Denazinemys*	*nodosa*		450	Fruitland	Fossil Forest	carapace fragments
SMP VP-3273		Baenidae	cf. *Denazinemys*	*nodosa*		372	Kirtland	Hunter Wash	carapace fragments
SMP VP-1610		Baenidae	?*Denazinemys*	*nodosa*		398	Kirtland	Hunter Wash	numerous carapace & plastron fragments
SMP VP-2751		Baenidae	?*Denazinemys*	*nodosa*		228	Kirtland	Hunter Wash	carapace fragments
NMMNH P-22698		Baenidae	*Neurankylus*	*baueri*		1616	Kirtland	Hunter Wash	carapace fragments
NMMNH P-27988		Baenidae	*Neurankylus*	*baueri*		3117	Kirtland	Hunter Wash	carapace & plastron sections
NMMNH P-22745		Baenidae	*Neurankylus*	*baueri*		1674	Fruitland	Fossil Forest	various shell fragments
NMMNH P-27788		Baenidae	*Neurankylus*	*baueri*		4015	Fruitland	Fossil Forest	numerous shell fragments
PMU.R 24	Exemplar 1	Baenidae	*Neurankylus*	*baueri*			Kirtland	Hunter Wash	nearly complete carapace, plastron, axial, & appendicular skeleton
PMU.R 25	Exemplar 2	Baenidae	*Neurankylus*	*baueri*			Kirtland	Hunter Wash	nearly complete carapace & incomplete plastron
PMU.R 26	Exemplar 3	Baenidae	*Neurankylus*	*baueri*			Kirtland	Hunter Wash?	incomplete carapace, plastron, & pelvic girdle
PMU.R 27	Exemplar 4	Baenidae	*Neurankylus*	*baueri*			Kirtland	Hunter Wash	incomplete carapace
SMP VP-1503		Baenidae	*Neurankylus*	*baueri*		283	Kirtland	Hunter Wash	plastron fragments
SMP VP-2379		Baenidae	*Neurankylus*	*baueri*		389a	Kirtland	De-na-zin	carapace with associated fragments & plastron
USNM 8344		Baenidae	*Neurankylus*	*baueri*	holotype		Kirtland	Hunter Wash	nearly complete carapace & plastron
USNM 8531		Baenidae	*Neurankylus*	*baueri*	hypotype		Kirtland	Hunter Wash	carapace & plastron
NMMNH P-22749		Baenidae	*Neurankylus*	cf. *N. baueri*		1674	Fruitland	Fossil Forest	shell fragment
NMMNH P-27776		Baenidae	*Neurankylus*	cf. *N. baueri*		4015	Fruitland	Fossil Forest	numerous shell fragments
NMMNH P-22655		Baenidae	*Neurankylus*	cf. *N. baueri*		1672	Fruitland	Fossil Forest	3 shell fragments
NMMNH P-22713		Baenidae	*Neurankylus*	cf. *N. baueri*		1652	Kirtland	Hunter Wash	various shell & bone fragments

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
NMMNH P-22792		Baenidae	*Neurankylus*	cf. *N. baueri*		1697	Kirtland	Hunter Wash	incomplete plastron & various fragments
NMMNH P-28850		Baenidae	?*Neurankylus*	cf. *N. baueri*		3117	Kirtland	Hunter Wash	carapace sections
PMU.R 28		Baenidae	*Neurankylus*	cf. *N. baueri*			Kirtland	De-na-zin?	incomplete carapace & plastron
ROM 864		Baenidae	*Neurankylus*	cf. *N. baueri*			Kirtland	Hunter Wash	incomplete carapace & plastron
SMP VP-1854		Baenidae	*Neurankylus*	cf. *N. baueri*		283	Kirtland	Hunter Wash	portion of plastron
SMP VP-1931		Baenidae	*Neurankylus*	cf. *N. baueri*		228	Kirtland	Hunter Wash	partial carapace
SMP VP-2102		Baenidae	*Neurankylus*	cf. *N. baueri*		421	Kirtland	Hunter Wash	incomplete carapace & nearly complete plastron
USNM 8621		Baenidae	*Neurankylus*	cf. *N. baueri*			Kirtland	Hunter Wash	posterior carapace
USNM 13228		Baenidae	*Neurankylus*	cf. *N. baueri*			Kirtland	Hunter Wash	carapace & plastron
USNM 11083		Baenidae	*Scabremys*	*ornata*			Kirtland	De-na-zin	carapace & plastron
USNM 12821		Baenidae	*Scabremys*	*ornata*			Kirtland	Hunter Wash	partial carapace & plastron
USNM 13229		Baenidae	*Scabremys*	*ornata*	holotype		Kirtland	Hunter Wash	carapace & plastron
AMNH 6066		Baenidae	*Thescelus*	*rapiens*	holotype		Kirtland	De-na-zin	incomplete carapace & plastron
SMP VP-2100		Baenidae	*Thescelus*	*rapiens*		421	Kirtland	Hunter Wash	plastron & carapace
PMU.R 22		Baenidae	*Thescelus*	cf. *T. rapiens*			Kirtland	Hunter Wash	incomplete carapace & complete plastron
SMP VP-1553		Baenidae	*Thescelus*	cf. *T. rapiens*		393	Kirtland	De-na-zin	carapace fragments & associated fragments
USNM 12818		Baenidae	*Thescelus*	*hemispherica*	holotype		Kirtland	Hunter Wash	carapace & plastron
PMU.R 23		Baenidae	*Thescelus*	cf. *T. hemispherica*			Kirtland	Hunter Wash	incomplete carapace & plastron
SMP VP-2168		Baenidae	*Thescelus*	sp.		421	Kirtland	Hunter Wash	nearly complete carapace & plastron
NMMNH P-49940	UA 5586	Baenidae	Baenidae indet.	Baenidae indet.		6205	Kirtland?	Hunter Wash?	plastron fragment
SMP VP-1845		Baenidae	Baenidae indet.	Baenidae indet.		319a	Kirtland	De-na-zin	carapace section
SMP VP-2055		Baenidae	Baenidae indet.	Baenidae indet.		421	Kirtland	Hunter Wash	costal fragment
SMP VP-2600		Baenidae	Baenidae indet.	Baenidae indet.		319a	Kirtland	De-na-zin	incomplete plastral bridge
SMP VP-3257		Baenidae	Baenidae indet.	Baenidae indet.		313a	Kirtland	De-na-zin	plastron fragment
SMP VP-3258		Baenidae	Baenidae indet.	Baenidae indet.		350	Kirtland	De-na-zin	carapace fragment

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
NMMNH P-22793		Baenidae	Baenidae indet.	Baenidae indet.		1698	Fruitland	Fossil Forest	various shell and bone fragments
NMMNH P-22796		Baenidae	Baenidae indet.	Baenidae indet.		1699	Kirtland	Hunter Wash	shell fragment
NMMNH P-22841		Baenidae	Baenidae indet.	Baenidae indet.		1721	Kirtland	De-na-zin	carapace/plastron fragments
NMMNH P-27632		Baenidae	Baenidae indet.	Baenidae indet.		4015	Fruitland	Fossil Forest	numerous shell fragments
NMMNH P-27759		Baenidae	Baenidae indet.	Baenidae indet.		4015	Fruitland	Fossil Forest	4 carapace fragments
NMMNH P-27762		Baenidae	Baenidae indet.	Baenidae indet.		4015	Fruitland	Fossil Forest	plastron/carapace fragments
NMMNH P-33024		Baenidae	Baenidae indet.	Baenidae indet.		4507	Kirtland	De-na-zin	incomplete innominate
NMMNH P-38401		Baenidae	Baenidae indet.	Baenidae indet.		4010	Kirtland	Hunter Wash	incomplete carapace
SMP VP-1154		Baenidae	Baenidae indet.	Baenidae indet.		372	Kirtland	Hunter Wash	costal plate
SMP VP-1387		Baenidae	Baenidae indet.	Baenidae indet.		391	Kirtland	Hunter Wash	carapace fragments
SMP VP-1399		Baenidae	Baenidae indet.	Baenidae indet.		388a	Kirtland	De-na-zin	right xiphiplastron
SMP VP-1470		Baenidae	Baenidae indet.	Baenidae indet.		281	Kirtland	Hunter Wash	carapace fragment
SMP VP-1507		Baenidae	Baenidae indet.	Baenidae indet.		228	Kirtland	Hunter Wash	part of carapace
SMP VP-1661		Baenidae	Baenidae indet.	Baenidae indet.		398	Kirtland	Hunter Wash	carapace & plastron fragments
SMP VP-1669		Baenidae	Baenidae indet.	Baenidae indet.		398	Kirtland	Hunter Wash	incomplete carapace & associated fragments
SMP VP-1791		Baenidae	Baenidae indet.	Baenidae indet.		281	Kirtland	Hunter Wash	xiphiplastron & other plastron fragments
SMP VP-1798		Baenidae	Baenidae indet.	Baenidae indet.		228	Kirtland	Hunter Wash	dorsal vertebra
SMP VP-1946		Baenidae	Baenidae indet.	Baenidae indet.		228	Kirtland	Hunter Wash	costal
SMP VP-2014		Baenidae	Baenidae indet.	Baenidae indet.		388a	Kirtland	De-na-zin	complete lower jaw
SMP VP-2644		Baenidae	Baenidae indet.	Baenidae indet.		450	Fruitland	Fossil Forest	nearly complete femur
SMP VP-2706		Baenidae	Baenidae indet.	Baenidae indet.		450	Fruitland	Fossil Forest	incomplete costal & plastron fragments
SMP VP-2721		Baenidae	Baenidae indet.	Baenidae indet.		450	Fruitland	Fossil Forest	carapace & plastron fragments, plus associated indet. bone material
USNM 8614		Baenidae	Baenidae indet.	Baenidae indet.			Kirtland	Hunter Wash	anterior half of plastron
USNM 8623		Baenidae	Baenidae indet.	Baenidae indet.			Kirtland	Hunter Wash	anterior half of plastron
USNM 8624		Baenidae	Baenidae indet.	Baenidae indet.			Kirtland	Hunter Wash	partial plastron
NMMNH P-22878		?Baenidae	?Baenidae indet.	?Baenidae indet.		1754	Kirtland	Hunter Wash	bone scrap
NMMNH P-32854		?Baenidae	?Baenidae indet.	?Baenidae indet.		4541	Kirtland	De-na-zin	15 carapace/plastron fragments

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
SMP VP-1491		?Baenidae	?Baenidae indet.	?Baenidae indet.		309a	Kirtland	De-na-zin	posterior marginal?
SMP VP-1670		?Baenidae	?Baenidae indet.	?Baenidae indet.		399	Kirtland	Hunter Wash	nuchal & plastron fragments
SMP VP-2358		?Baenidae	?Baenidae indet.	?Baenidae indet.		281	Kirtland	Hunter Wash	plastron fragments
SMP VP-2605		?Baenidae	?Baenidae indet.	?Baenidae indet.		319a	Kirtland	De-na-zin	neural
SMP VP-2820		?Baenidae	?Baenidae indet.	?Baenidae indet.		228	Kirtland	Hunter Wash	carapace neural
NMMNH P-22813		?Baenidae	?Baenidae indet.	?Baenidae indet.		1702	Fruitland	Fossil Forest	?plastron section & various carapace/plastron fragments
SMP VP-3389		?Baenidae indet.	?Baenidae indet.	?Baenidae indet.		461	Kirtland	Hunter Wash	marginal/carapace fragment
SMP VP-1907		Kinosternoidea indet.	Kinosternoidea indet.	Kinosternoidea indet.		350	Kirtland	De-na-zin	part of left hypoplastron
SMP VP-2004		Kinosternoidea indet.	Kinosternoidea indet.	Kinosternoidea indet.		350	Kirtland	De-na-zin	two costal fragments & right hypoplastron
SMP VP-2009		Kinosternoidea indet.	Kinosternoidea indet.	Kinosternoidea indet.		350	Kirtland	De-na-zin	right xiphiplastron
SMP VP-2533		Kinosternoidea indet.	Kinosternoidea indet.	Kinosternoidea indet.		350	Kirtland	De-na-zin	right costal (8th?)
SMP VP-3274		Kinosternoidea indet.	Kinosternoidea indet.	Kinosternoidea indet.		350	Kirtland	De-na-zin	left costal (2nd?)
NMMNH P-49785	UA 14836	Kinosternoidea indet.	Kinosternoidea indet.	Kinosternoidea indet.		6340	Kirtland?	De-na-zin?	peripheral
USNM 11084		Nanhsiungchelyidae	*Basilemys*	*gaffneyi*	holotype		Kirtland	Hunter Wash	carapace & plastron
NMMNH P-27613		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		4015	Fruitland	Fossil Forest	carapace fragments
NMMNH P-27623		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		4015	Fruitland	Fossil Forest	peripheral fragment
NMMNH P-27630		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		4015	Fruitland	Fossil Forest	numerous fragments
NMMNH P-27775		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		4015	Fruitland	Fossil Forest	plastron section & 3 fragments
NMMNH P-28935		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		3510	Kirtland	Hunter Wash	carapace fragments
NMMNH P-28952		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		3496	Kirtland	Hunter Wash	peripheral fragments
NMMNH P-22651		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		1672	Fruitland	Fossil Forest	shell fragment
NMMNH P-22742		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		1674	Fruitland	Fossil Forest	shell fragments
NMMNH P-22744		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		1674	Fruitland	Fossil Forest	various shell fragments
NMMNH P-22871		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		1746	Kirtland	Hunter Wash	various shell & bone fragments
NMMNH P-22935		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		1791	Kirtland	Hunter Wash	carapace fragment
NMMNH P-22947		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		1777	Kirtland	Hunter Wash	limb osteoderm

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
NMMNH P-27942		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		1586	Kirtland	Hunter Wash	carapace fragments
NMMNH P-32828		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		4010	Kirtland	Hunter Wash	limb osteoderm
NMMNH P-44517		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		4000	Kirtland?	Hunter Wash?	carapace fragments
PMU.R 29		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*			Kirtland	Hunter Wash	nearly complete carapace & plastron
SMP VP-1106		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		316	Kirtland	Hunter Wash	incomplete humerus & femur, plus other indet. fragments
SMP VP-1382		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		361	Kirtland	De-na-zin	carapace fragment
SMP VP-1475		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		365	Kirtland	Hunter Wash	edge of carapace
SMP VP-1510		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		228	Kirtland	Hunter Wash	plastron fragment
SMP VP-1522		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		281	Kirtland	Hunter Wash	carapace fragments
SMP VP-1527		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		281	Kirtland	Hunter Wash	carapace fragments
SMP VP-1566		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		281	Kirtland	Hunter Wash	carapace fragments
SMP VP-1652		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		281	Kirtland	Hunter Wash	carapace fragment
SMP VP-1653		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		281	Kirtland	Hunter Wash	carapace/plastron fragments
SMP VP-1678		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		400	Kirtland	Hunter Wash	partial right humerus
SMP VP-1852		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		228	Kirtland	Hunter Wash	limb osteoderm
SMP VP-2153		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		281	Kirtland	Hunter Wash	carapace fragment
SMP VP-2359		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		281	Kirtland	Hunter Wash	carapace fragment
SMP VP-2797		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		450	Fruitland	Fossil Forest	epiplastron
SMP VP-3366		Nanhsiungchelyidae	*Basilemys*	cf. *B. gaffneyi*		450	Fruitland	Fossil Forest	partial plastron, fragments of femur, pelvic girdle, & carapace/plastron
SMP VP-1146		Nanhsiungchelyidae	cf. *Basilemys*	cf. *B. gaffneyi*		365	Kirtland	Hunter Wash	terminal phalanx
SMP VP-1158		Nanhsiungchelyidae	cf. *Basilemys*	cf. *B. gaffneyi*		228	Kirtland	Hunter Wash	incomplete humerus
NMMNH P-22568		Pleurosternidae	*Compsemys*	sp.		1464	Kirtland	Hunter Wash	2 carapace/plastron fragments
NMMNH P-22741		Pleurosternidae	*Compsemys*	sp.		1674	Fruitland	Fossil Forest	plastron fragment
NMMNH P-22809		Pleurosternidae	*Compsemys*	sp.		1700	Fruitland	Fossil Forest	3 shell fragments
NMMNH P-28326		Pleurosternidae	*Compsemys*	sp.		1882	Fruitland	Fossil Forest	2 shell fragments
NMMNH P-33021		Pleurosternidae	*Compsemys*	sp.		4570	Kirtland	De-na-zin	4 carapace fragments
NMMNH P-40512		Pleurosternidae	*Compsemys*	sp.		3488	Kirtland	De-na-zin	incomplete carapace & plastron

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
NMMNH P-49819	UA 14391	Pleurosternidae	*Compsemys*	sp.		6551	Kirtland?	De-na-zin?	carapace fragment
NMMNH P-49821	UA 14388	Pleurosternidae	*Compsemys*	sp.		6554	Kirtland?	De-na-zin?	entoplaston
NMMNH P-49827	UA 14393	Pleurosternidae	*Compsemys*	sp.		6559	Kirtland?	Hunter Wash?	4 shell fragment
NMMNH P-49844	UA 14392	Pleurosternidae	*Compsemys*	sp.		6542	Kirtland?	Hunter Wash?	plastron fragment
SMP VP-1892		Pleurosternidae	*Compsemys*	sp.		350	Kirtland	De-na-zin	peripheral
SMP VP-1904		Pleurosternidae	*Compsemys*	sp.		350	Kirtland	De-na-zin	carapace fragment
SMP VP-1915		Pleurosternidae	*Compsemys*	sp.		350	Kirtland	De-na-zin	five carapace fragments
SMP VP-1916		Pleurosternidae	*Compsemys*	sp.		350	Kirtland	De-na-zin	carapace fragment
SMP VP-2002		Pleurosternidae	*Compsemys*	sp.		350	Kirtland	De-na-zin	costal fragment
SMP VP-2003		Pleurosternidae	*Compsemys*	sp.		350	Kirtland	De-na-zin	five costal fragments
SMP VP-2006		Pleurosternidae	*Compsemys*	sp.		350	Kirtland	De-na-zin	four plastron fragments
SMP VP-2201		Pleurosternidae	*Compsemys*	sp.		319a	Kirtland	De-na-zin	peripheral
SMP VP-2648		Pleurosternidae	*Compsemys*	sp.		350	Kirtland	De-na-zin	carapace fragments
SMP VP-2630		Pleurosternidae	?*Compsemys*	sp.		313a	Kirtland	De-na-zin	incomplete costal
NMMNH P-26230		Trionychidae	*Aspideretoides*	*austerus*		3227	Kirtland	De-na-zin	costal fragments & neural
NMMNH P-27847		Trionychidae	*Aspideretoides*	*austerus*		3226	Kirtland	De-na-zin	incomplete costals, xiphiplastron, hyoplastron, & girdle
SMP VP-811		Trionychidae	*Aspideretoides*	*austerus*		210	Kirtland	De-na-zin	several pieces of plastron and carapace
SMP VP-1364		Trionychidae	*Aspideretoides*	*austerus*		389a	Kirtland	De-na-zin	hypoplastron & other plastral elements
SMP VP-1717		Trionychidae	*Aspideretoides*	*austerus*		319a	Kirtland	De-na-zin	incomplete right hypoplastron & other plastron fragments
SMP VP-1844		Trionychidae	*Aspideretoides*	*austerus*		319a	Kirtland	De-na-zin	carapace fragments
SMP VP-1868		Trionychidae	*Aspideretoides*	*austerus*		382	Kirtland	De-na-zin	costals & nuchal
SMP VP-1959		Trionychidae	*Aspideretoides*	*austerus*		210	Kirtland	De-na-zin	large plastron fragment
SMP VP-2376		Trionychidae	*Aspideretoides*	*austerus*		389a	Kirtland	De-na-zin	costal & carapace fragments
USNM 6550		Trionychidae	*Aspideretoides*	*austerus*	see text		Kirtland	De-na-zin	partial carapace
USNM 12988		Trionychidae	*Aspideretoides*	*austerus*			Kirtland	De-na-zin	anterior part of carapace
USNM 12986		Trionychidae	*Aspideretoides*	*ovatus*	holotype		Kirtland	Hunter Wash?	partial carapace & plastron

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
USNM 12987		Trionychidae	*Aspideretoides*	*ovatus*			Kirtland	Hunter Wash?	posterior half of carapace
NMMNH P-27779		Trionychidae	*Aspideretoides*	*robustus*		4015	Fruitland	Fossil Forest	incomplete right hyoplastron
NMMNH P-27826		Trionychidae	*Aspideretoides*	*robustus*		4015	Fruitland	Fossil Forest	incomplete costal & numerous fragments
NMMNH P-27572		Trionychidae	*Aspideretoides*	*robustus*		4015	Fruitland	Fossil Forest	fragments
NMMNH P-27628		Trionychidae	*Aspideretoides*	*robustus*		4015	Fruitland	Fossil Forest	numerous carapace/plastron fragments
NMMNH P-27633		Trionychidae	*Aspideretoides*	*robustus*		4015	Fruitland	Fossil Forest	various carapace/plastron fragments
NMMNH P-27752		Trionychidae	*Aspideretoides*	*robustus*		4015	Fruitland	Fossil Forest	incomplete costal & various fragments
NMMNH P-27768		Trionychidae	*Aspideretoides*	*robustus*		4015	Fruitland	Fossil Forest	2 plastron fragments
NMMNH P-27777		Trionychidae	*Aspideretoides*	*robustus*		4015	Fruitland	Fossil Forest	carapace/plastron fragments
NMMNH P-27941		Trionychidae	*Aspideretoides*	*robustus*		1581	Kirtland	Hunter Wash	incomplete costal
NMMNH P-28321		Trionychidae	*Aspideretoides*	*robustus*		1882	Fruitland	Fossil Forest	costal fragment
NMMNH P-30066		Trionychidae	*Aspideretoides*	*robustus*		4274	Kirtland	Hunter Wash	costal
NMMNH P-30756		Trionychidae	*Aspideretoides*	*robustus*		4104	Fruitland/ Kirtland	unknown	costal fragments
NMMNH P-39632		Trionychidae	*Aspideretoides*	*robustus*		5163	Kirtland	Hunter Wash	2 fused incomplete costals & associated fragments
NMMNH P-49856	UA 11737	Trionychidae	*Aspideretoides*	*robustus*		6548	Kirtland?	Hunter Wash?	incomplete costal
NMMNH P-49862	UA 13319	Trionychidae	*Aspideretoides*	*robustus*		6560	Kirtland?	Hunter Wash?	incomplete costal
PMU.R 30		Trionychidae	*Aspideretoides*	*robustus*			Kirtland	Hunter Wash	nearly complete carapace
PMU.R 31		Trionychidae	*Aspideretoides*	*robustus*			Kirtland	Hunter Wash	right hypoplatron & xiphiplastron, plus left hyoplastron, hypoplastron, & xiphiplastron
SMP VP-1612		Trionychidae	*Aspideretoides*	*robustus*		400	Kirtland	Hunter Wash	carapace fragments
SMP VP-1667		Trionychidae	*Aspideretoides*	*robustus*		398	Kirtland	Hunter Wash	incomplete nuchal, both xiphiplastra, & associated fragments
SMP VP-1679		Trionychidae	*Aspideretoides*	*robustus*		400	Kirtland	Hunter Wash	incomplete costal
SMP VP-1681		Trionychidae	*Aspideretoides*	*robustus*		400	Kirtland	Hunter Wash	costal fragments

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
SMP VP-1682		Trionychidae	*Aspideretoides*	*robustus*		400	Kirtland	Hunter Wash	nearly complete costal
SMP VP-1685		Trionychidae	*Aspideretoides*	*robustus*		396	Kirtland	Hunter Wash	incomplete xiphiplastron
SMP VP-1856		Trionychidae	*Aspideretoides*	*robustus*		281	Kirtland	Hunter Wash	carapace fragments
SMP VP-2166		Trionychidae	*Aspideretoides*	*robustus*		228	Kirtland	Hunter Wash	carapace fragments
SMP VP-2698		Trionychidae	*Aspideretoides*	*robustus*		463	Fruitland	Fossil Forest	carapace fragments, including nuchal & neural
USNM 8350		Trionychidae	*Aspideretoides*	*robustus*			Kirtland	Farmington?	left hypoplastron
USNM 8538		Trionychidae	*Aspideretoides*	*robustus*	holotype		Kirtland	Hunter Wash	complete carapace
USNM 12989		Trionychidae	*Aspideretoides*	*robustus*			Kirtland	Hunter Wash	left hyoplastron & hypoplastron
NMMNH P-33914		Trionychidae	*Aspideretoides*	cf. *A. austerus*		4721	Kirtland	De-na-zin	2 incomplete costals
NMMNH P-22751		Trionychidae	*Aspideretoides*	cf. *A. robustus*		1675	Fruitland	Fossil Forest	various carapace/plastron fragments
NMMNH P-22934		Trionychidae	*Aspideretoides*	cf. *A. robustus*		1790	Kirtland	Hunter Wash	incomplete costal
NMMNH P-22949		Trionychidae	*Aspideretoides*	cf. *A. robustus*		1805	Kirtland	Hunter Wash?	2 shell fragments
NMMNH P-27769		Trionychidae	*Aspideretoides*	cf. *A. robustus*		4015	Fruitland	Fossil Forest	plastron fragments
NMMNH P-33916		Trionychidae	*Aspideretoides*	cf. *A. robustus*		4010	Kirtland	Hunter Wash	nearly complete left xiphiplastron
NMMNH P-28320		Trionychidae	*Aspideretoides*	cf. *A. robustus*		1882	Fruitland	Fossil Forest	numerous carapace fragments
NMMNH P-33912		Trionychidae	*Aspideretoides*	cf. *A. robustus*		4717	Fruitland	Fossil Forest	numerous carapace/costal fragments
NMMNH P-49848	UA 14397	Trionychidae	*Aspideretoides*	cf. *A. robustus*		6547	Kirtland?	Hunter Wash?	shell fragment
NMMNH P-49786	UA 14399	Trionychidae	*Aspideretoides*	cf. *A. robustus*		6340	Kirtland?	Hunter Wash?	shell fragment
SMP VP-1525		Trionychidae	*Aspideretoides*	cf. *A. robustus*		281	Kirtland	Hunter Wash	costal & other fragments
NMMNH P-19200		Trionychidae	*Aspideretoides*	sp.		1549	Kirtland	Hunter Wash	incomplete carapace
NMMNH P-22550		Trionychidae	*Aspideretoides*	sp.		1587	Kirtland	Hunter Wash	carapace fragment
NMMNH P-27829		Trionychidae	*Aspideretoides*	sp.		4015	Fruitland	Fossil Forest	numerous carapace fragments
NMMNH P-22729		Trionychidae	*Aspideretoides*	sp.		1665	Kirtland	De-na-zin	incomplete costal
NMMNH P-22735		Trionychidae	*Aspideretoides*	sp.		1673	Kirtland	Hunter Wash	hypoplastron & associated fragment

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
NMMNH P-49818	UA 14396	Trionychidae	*Aspideretoides*	sp.		6559	Kirtland?	Hunter Wash?	2 shell fragments
NMMNH P-49822	UA 11741	Trionychidae	*Aspideretoides*	sp.		6559	Kirtland?	Hunter Wash?	8 neurals & other fragments
NMMNH P-49832	UA 14412	Trionychidae	*Aspideretoides*	sp.		6622	Kirtland?	De-na-zin?	costal fragment
SMP VP-1493		Trionychidae	*Aspideretoides*	sp		319a	Kirtland	De-na-zin	carapace fragments
SMP VP-1519		Trionychidae	*Aspideretoides*	sp.		365	Kirtland	Hunter Wash	carapace fragments
SMP VP-2045		Trionychidae	*Aspideretoides*	sp.		388a	Kirtland	De-na-zin	carapace fragments
SMP VP-2601		Trionychidae	*Aspideretoides*	sp.		319a	Kirtland	De-na-zin	carapace fragment
NMMNH P-49853	UA 14400	Trionychidae	cf. *Aspideretoides*	sp.		6552	Kirtland?	De-na-zin?	plastron fragment
SMP VP-1368		Trionychidae	cf. *Aspideretoides*	sp.		349	Kirtland	Hunter Wash	part of carapace
SMP VP-1426		Trionychidae	cf. *Aspideretoides*	sp.		361	Kirtland	De-na-zin	proximal end of left femur
SMP VP-1594		Trionychidae	cf. *Aspideretoides*	sp.		398	Kirtland	Hunter Wash	carapace fragments
SMP VP-1595		Trionychidae	cf. *Aspideretoides*	sp.		398	Kirtland	Hunter Wash	carapace fragments
SMP VP-1810		Trionychidae	cf. *Aspideretoides*	sp.		409	Kirtland	Hunter Wash	carapace fragment
SMP VP-1949		Trionychidae	cf. *Aspideretoides*	sp.		228	Kirtland	Hunter Wash	carapace fragment
SMP VP-2803		Trionychidae	cf. *Aspideretoides*	sp.		450	Fruitland	Fossil Forest	costal, marginal, & other carapace fragments
NMMNH P-22832		Trionychidae	?*Aspideretoides*	sp.		1714	Kirtland	Hunter Wash	various shell fragments
NMMNH P-26204		Trionychidae	?*Aspideretoides*	sp.		3228	Kirtland	De-na-zin	costal fragment
NMMNH P-27782		Trionychidae	?*Aspideretoides*	sp.		4015	Fruitland	Fossil Forest	numerous carapace/plastron fragments
NMMNH P-22627		Trionychidae	Plastomeninae indet.	Plastomeninae indet.		1639	Kirtland	De-na-zin	hypoplastron fragment
NMMNH P-27479		Trionychidae	Plastomeninae indet.	Plastomeninae indet.		4015	Fruitland	Fossil Forest	numerous carapace fragments
SMP VP-742		Trionychidae	Plastomeninae indet.	Plastomeninae indet.		228	Kirtland	Hunter Wash	carapace & plastron fragments
SMP VP-2034		Trionychidae	Plastomeninae indet.	Plastomeninae indet.		421	Kirtland	Hunter Wash	three carapace fragments

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
SMP VP-2154		Trionychidae	Trionychidae indet.	Trionychidae indet.		281	Kirtland	Hunter Wash	plastron fragment
SMP VP-2156		Trionychidae	Trionychidae indet.	Trionychidae indet.		281	Kirtland	Hunter Wash	carapace fragment
SMP VP-3348		Trionychidae	Trionychidae indet.	Trionychidae indet.		409	Kirtland	Hunter Wash	incomplete costal
NMMNH P-22583		Trionychidae	Trionychidae indet.	Trionychidae indet.		1613	Kirtland	Hunter Wash	carapace fragment
NMMNH P-22804		Trionychidae	Trionychidae indet.	Trionychidae indet.		1699	Kirtland	Hunter Wash	costal fragment & indet. fragment
NMMNH P-26261		Trionychidae	Trionychidae indet.	Trionychidae indet.		3245	Kirtland	De-na-zin	incomplete humerus
NMMNH P-27903		Trionychidae	Trionychidae indet.	Trionychidae indet.		1625	Fruitland	Fossil Forest	carapace & ?dinosaur bone fragment
NMMNH P-28324		Trionychidae	Trionychidae indet.	Trionychidae indet.		1882	Fruitland	Fossil Forest	numerous carapace fragments
NMMNH P-28909		Trionychidae	Trionychidae indet.	Trionychidae indet.		3964	Kirtland	Hunter Wash	incomplete humerus
NMMNH P-32845		Trionychidae	Trionychidae indet.	Trionychidae indet.		4542	Kirtland	De-na-zin	carapace/plastron fragments
NMMNH P-32851		Trionychidae	Trionychidae indet.	Trionychidae indet.		2387	Fruitland	Fossil Forest	carapace/plastron fragments
NMMNH P-32852		Trionychidae	Trionychidae indet.	Trionychidae indet.		2387	Fruitland	Fossil Forest	carapace/plastron fragments
NMMNH P-49825		Trionychidae	Trionychidae indet.	Trionychidae indet.		6558	Kirtland	Hunter Wash	costal fragment
NMMNH P-49855	UA 14399	Trionychidae	Trionychidae indet.	Trionychidae indet.		6552	Kirtland?	De-na-zin?	2 shell fragments
SMP VP-1476		Trionychidae	Trionychidae indet.	Trionychidae indet.		365	Kirtland	Hunter Wash	plastron fragment
SMP VP-1509		Trionychidae	Trionychidae indet.	Trionychidae indet.		228	Kirtland	Hunter Wash	carapace & plastron fragments
SMP VP-1513		Trionychidae	Trionychidae indet.	Trionychidae indet.		365	Kirtland	Hunter Wash	carapace/plastron fragments
SMP VP- SMP VP-1558		Trionychidae	Trionychidae indet.	Trionychidae indet.		389a	Kirtland	De-na-zin	carapace fragment
SMP VP-1567		Trionychidae	Trionychidae indet.	Trionychidae indet.		228	Kirtland	Hunter Wash	carapace fragments

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
SMP VP-1683		Trionychidae	Trionychidae indet.	Trionychidae indet.		400	Kirtland	Hunter Wash	carapace fragments
SMP VP-1690		Trionychidae	Trionychidae indet.	Trionychidae indet.		409	Kirtland	Hunter Wash	carapace fragment
SMP VP-1691		Trionychidae	Trionychidae indet.	Trionychidae indet.		409	Kirtland	Hunter Wash	carapace fragment
SMP VP-1695		Trionychidae	Trionychidae indet.	Trionychidae indet.		409	Kirtland	Hunter Wash	carapace fragments
SMP VP-1817		Trionychidae	Trionychidae indet.	Trionychidae indet.		365	Kirtland	Hunter Wash	two carapace fragments
SMP VP-1857		Trionychidae	Trionychidae indet.	Trionychidae indet.		365	Kirtland	Hunter Wash	incomplete costal
SMP VP-1917		Trionychidae	Trionychidae indet.	Trionychidae indet.		350	Kirtland	De-na-zin	carapace fragments
SMP VP-1947		Trionychidae	Trionychidae indet.	Trionychidae indet.		228	Kirtland	Hunter Wash	incomplete costal
SMP VP-1996		Trionychidae	Trionychidae indet.	Trionychidae indet.		412	Kirtland	Hunter Wash	costal fragment
SMP VP-2005		Trionychidae	Trionychidae indet.	Trionychidae indet.		350	Kirtland	De-na-zin	four costal fragments
SMP VP-2224		Trionychidae	Trionychidae indet.	Trionychidae indet.		433	Kirtland	Hunter Wash	carapace/plastron fragments
SMP VP-2388		Trionychidae	Trionychidae indet.	Trionychidae indet.		450	Fruitland	Fossil Forest	carapace fragments
SMP VP-2403		Trionychidae	Trionychidae indet.	Trionychidae indet.		450	Fruitland	Fossil Forest	carapace & plastron fragments from multiple individuals
SMP VP-2404		Trionychidae	Trionychidae indet.	Trionychidae indet.		450	Fruitland	Fossil Forest	carapace fragments
SMP VP-2423		Trionychidae	Trionychidae indet.	Trionychidae indet.		350	Kirtland	De-na-zin	carapace fragments
SMP VP-2442		Trionychidae	Trionychidae indet.	Trionychidae indet.		450	Fruitland	Fossil Forest	carapace fragments from multiple taxa
SMP VP-2460		Trionychidae	Trionychidae indet.	Trionychidae indet.		451	Kirtland	Hunter Wash	carapace fragments
SMP VP-2487		Trionychidae	Trionychidae indet.	Trionychidae indet.		350	Kirtland	De-na-zin	two carapace fragments
SMP VP-2528		Trionychidae	Trionychidae indet.	Trionychidae indet.		452	Kirtland	Hunter Wash	carapace fragments

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
SMP VP-2530		Trionychidae	Trionychidae indet.	Trionychidae indet.		452	Kirtland	Hunter Wash	neural & carapace fragments
SMP VP-2531		Trionychidae	Trionychidae indet.	Trionychidae indet.		452	Kirtland	Hunter Wash	carapace fragments
SMP VP-2532		Trionychidae	Trionychidae indet.	Trionychidae indet.		452	Kirtland	Hunter Wash	carapace fragments
SMP VP-2541		Trionychidae	Trionychidae indet.	Trionychidae indet.		363a	Kirtland	De-na-zin	carapace fragment
SMP VP-2551		Trionychidae	Trionychidae indet.	Trionychidae indet.		450	Fruitland	Fossil Forest	carapace fragment
SMP VP-2586		Trionychidae	Trionychidae indet.	Trionychidae indet.		450	Fruitland	Fossil Forest	carapace fragment
SMP VP-2635		Trionychidae	Trionychidae indet.	Trionychidae indet.		450	Fruitland	Fossil Forest	carapace fragment
SMP VP-2716		Trionychidae	Trionychidae indet.	Trionychidae indet.		228	Kirtland	Hunter Wash	carapace fragment
SMP VP-2728		Trionychidae	Trionychidae indet.	Trionychidae indet.		450	Fruitland	Fossil Forest	carapace fragments
SMP VP-2764		Trionychidae	Trionychidae indet.	Trionychidae indet.		450	Fruitland	Fossil Forest	incomplete costal
SMP VP-2766		Trionychidae	Trionychidae indet.	Trionychidae indet.		450	Fruitland	Fossil Forest	carapace fragments
SMP VP-2772		Trionychidae	Trionychidae indet.	Trionychidae indet.		450	Fruitland	Fossil Forest	incomplete neural
SMP VP-2819		Trionychidae	Trionychidae indet.	Trionychidae indet.		228	Kirtland	Hunter Wash	carapace neural
SMP VP-2839		Trionychidae	Trionychidae indet.	Trionychidae indet.		450	Fruitland	Fossil Forest	carapace fragments
SMP VP-2847		Trionychidae	Trionychidae indet.	Trionychidae indet.		450	Fruitland	Fossil Forest	carapace fragments
SMP VP-2852		Trionychidae	Trionychidae indet.	Trionychidae indet.		450	Fruitland	Fossil Forest	carapace fragments & associated indet. bone material
SMP VP-3271		Trionychidae	Trionychidae indet.	Trionychidae indet.		372	Kirtland	Hunter Wash	incomplete neural
SMP VP-3272		Trionychidae	Trionychidae indet.	Trionychidae indet.		372	Kirtland	Hunter Wash	carapace fragment
SMP VP-1135		Cryptodira indet.	Cryptodira indet.	Cryptodira indet.		373	Kirtland	Hunter Wash	incomplete scapula

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
NMMNH P-22743		Testudines indet.	Testudines indet.	Testudines indet.		1674	Fruitland	Fossil Forest	various shell & bone fragments
NMMNH P-22826		Testudines indet.	Testudines indet.	Testudines indet.		1708	Kirtland	Hunter Wash	various bone fragments
NMMNH P-22921		Testudines indet.	Testudines indet.	Testudines indet.		1782	Kirtland	Hunter Wash	distal end of femur
NMMNH P-22939		Testudines indet.	Testudines indet.	Testudines indet.		1795	Kirtland/ Fruitland	unknown	incomplete scapula?
NMMNH P-26246		Testudines indet.	Testudines indet.	Testudines indet.		1708	Kirtland	Hunter Wash	5 pelvic fragments
NMMNH P-26251		Testudines indet.	Testudines indet.	Testudines indet.		3226	Kirtland	De-na-zin	incomplete ?coracoid
NMMNH P-27827		Testudines indet.	Testudines indet.	Testudines indet.		4015	Fruitland	Fossil Forest	incomplete humerus
NMMNH P-22510		Testudines indet.	Testudines indet.	Testudines indet.		1571	Kirtland	Hunter Wash	2 vertebrae
NMMNH P-32823		Testudines indet.	Testudines indet.	Testudines indet.		4010	Kirtland	Hunter Wash	incomplete phalanx
NMMNH P-49847		Testudines indet.	Testudines indet.	Testudines indet.		6546	Kirtland?	Hunter Wash?	shell fragment
NMMNH P-22624		Testudines indet.	Testudines indet.	Testudines indet.		1638	unknown	unknown	pelvis
NMMNH P-37762		Testudines indet.	Testudines indet.	Testudines indet.		5197	Kirtland	De-na-zin	2 carapace fragments
NMMNH P-37787		Testudines indet.	Testudines indet.	Testudines indet.		5197	Kirtland	De-na-zin	14 carapace fragments
NMMNH P-33023		Testudines indet.	Testudines indet.	Testudines indet.		4570	Kirtland	De-na-zin	tibia
SMP VP-817		Testudines indet.	Testudines indet.	Testudines indet.		210	Kirtland	De-na-zin	?posterior part of left ramus
SMP VP-1091		Testudines indet.	Testudines indet.	Testudines indet.		365	Kirtland	Hunter Wash	ungual
SMP VP-1332		Testudines indet.	Testudines indet.	Testudines indet.		385	Kirtland	Hunter Wash	incomplete scapulocoracoid
SMP VP-1420		Testudines indet.	Testudines indet.	Testudines indet.		385	Kirtland	Hunter Wash	girdle & miscellaneous fragments
SMP VP-1471		Testudines indet.	Testudines indet.	Testudines indet.		281	Kirtland	Hunter Wash	pelvic element

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Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
SMP VP-1484		Testudines indet.	Testudines indet.	Testudines indet.		281	Kirtland	Hunter Wash	ungual
SMP VP-1530		Testudines indet.	Testudines indet.	Testudines indet.		281	Kirtland	Hunter Wash	ungual & distal end of phalanx
SMP VP-1531		Testudines indet.	Testudines indet.	Testudines indet.		281	Kirtland	Hunter Wash	girdle
SMP VP-1800		Testudines indet.	Testudines indet.	Testudines indet.		228	Kirtland	Hunter Wash	limb fragments
SMP VP-1903		Testudines indet.	Testudines indet.	Testudines indet.		350	Kirtland	De-na-zin	promimal portion of pelvic element (ilium?)
SMP VP-1919		Testudines indet.	Testudines indet.	Testudines indet.		417	Kirtland	Hunter Wash	skull roof?
SMP VP-2000		Testudines indet.	Testudines indet.	Testudines indet.		350	Kirtland	De-na-zin	skull element
SMP VP-2015		Testudines indet.	Testudines indet.	Testudines indet.		420a	Kirtland	De-na-zin	humerus fragment
SMP VP-2035		Testudines indet.	Testudines indet.	Testudines indet.		421	Kirtland	Hunter Wash	unidentified girdle element
SMP VP-2037		Testudines indet.	Testudines indet.	Testudines indet.		421	Kirtland	Hunter Wash	nearly complete left humerus
SMP VP-2084		Testudines indet.	Testudines indet.	Testudines indet.		421	Kirtland	Hunter Wash	incomplete right humerus
SMP VP-2537		Testudines indet.	Testudines indet.	Testudines indet.		316	Kirtland	Hunter Wash	?humerus
SMP VP-2549		Testudines indet.	Testudines indet.	Testudines indet.		450	Fruitland	Fossil Forest	five carapace fragments
SMP VP-2643		Testudines indet.	Testudines indet.	Testudines indet.		450	Fruitland	Fossil Forest	plastron fragment
SMP VP-2681		Testudines indet.	Testudines indet.	Testudines indet.		228	Kirtland	Hunter Wash	incomplete plastron
SMP VP-2739		Testudines indet.	Testudines indet.	Testudines indet.		228	Kirtland	Hunter Wash	incomplete left femur
SMP VP-2747		Testudines indet.	Testudines indet.	Testudines indet.		228	Kirtland	Hunter Wash	cervical vertebra
SMP VP-2768		Testudines indet.	Testudines indet.	Testudines indet.		450	Fruitland	Fossil Forest	distal end of humerus
SMP VP-2777		Testudines indet.	Testudines indet.	Testudines indet.		450	Fruitland	Fossil Forest	?limb osteoderm

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(continued)

Current number	Previous number	Family	Genus	Species	Type status	Locality Number	Formation	Member	Description
SMP VP-2795		Testudines indet.	Testudines indet.	Testudines indet.		450	Fruitland	Fossil Forest	incomplete ?humerus
SMP VP-3343		Testudines indet.	Testudines indet.	Testudines indet.		409	Kirtland	Hunter Wash	incomplete plastron
SMP VP-3344		Testudines indet.	Testudines indet.	Testudines indet.		409	Kirtland	Hunter Wash	incomplete plastron
SMP VP-3373		Testudines indet.	Testudines indet.	Testudines indet.		392	Kirtland	De-na-zin	plastron fragment
SMP VP-3377		Testudines indet.	Testudines indet.	Testudines indet.		461	Kirtland	Hunter Wash	incomplete costal & 2 carapace fragments
SMP VP-3382		Testudines indet.	Testudines indet.	Testudines indet.		450	Fruitland	Fossil Forest	2 plastron fragments
SMP VP-3388		Testudines indet.	Testudines indet.	Testudines indet.		461	Kirtland	Hunter Wash	2 carapace fragments
SMP VP-2381		Testudines indet.	Testudines indet.	Testudines indet.		382	Kirtland	De-na-zin	?girdle element & 2 fragments
SMP VP-2443		Testudines indet.	Testudines indet.	Testudines indet.		421	Kirtland	Hunter Wash	distal & proximal ends of a limb bone
SMP VP-3373		?Testudines indet.	?Testudines indet.	?Testudines indet.		461	Kirtland	Hunter Wash	?carapace/plastron fragments
NMMNH P-28984		various taxa	various taxa	various taxa		4098	Kirtland	unknown	numerous bone fragments
NMMNH P-32887		various taxa	various taxa	various taxa		2387	Fruitland	Fossil Forest	numerous carapace, plastron, axial skeleton fragments
NMMNH P-49857	UA 14835	various taxa	various taxa	various taxa		6552	Kirtland?	De-na-zin?	13 shell fragments

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