

### Latex Peel Preparation

The rock segments containing the impressions were reconstructed and joints smoothed using clean molding clay.

Once prepared, the impressions were sprayed with an even coat of a releasing agent. Thin successive layers of “Smooth-On” silicone mold rubber were applied. Once set, the rubber was backed with a layer of plaster to preserve and support the three-dimensional shape of the carapace molds. The molds were whitened using ammonium chloride ( $\text{NH}_4\text{Cl}$ ) to improve contrast.

### Characters used for the PAUP analysis

1. Nasals 0: present; 1: absent.
2. Prefrontals meet 0: not on midline; 1: on midline,
3. Prefrontal-vomer contact 0: no; 1: yes.
4. Processus pterygoideus externus 0: no flange; 1: with vertical flange.
5. Foramen palatinum posterius 0: small or moderate; 1: very large.
6. Interpterygoid vacuity 0: open; 1: closed.
7. Processus trochlearis oticum 0: absent; 1: present.
8. Middle ear with 0: nothing 1: pterygoid floor.
9. Canalis caroticus internus 0: not formed by pterygoid; 1: partially or entirely by pterygoid.
10. Canalis caroticus internus 0: formed partially by pterygoid; 1: formed entirely by pterygoid..
11. Split between palatine artery and internal carotid artery 0: outside skull; 1: embedded in bone.
12. Floor of canalis caroticus internus 0: thin or absent; 1: thick.
13. Palatine artery 0: palatine equal to or greater than carotid; 1: palatine less than carotid.
14. Foramen posterius canalis carotici interni formed by 0: BS or PT; 1: BS and PT as in baenids.
15. Fenestra perilymphatica 0: large (normal); 1: small.
16. Blind pits on BS 0: no; 1: yes.
17. Posterior temporal emargination 0: not developed; 1: at least partially developed.
18. PA-SQ contact 0: present; 1: absent.
19. PO-SQ contact 0: present; 1: absent.
20. Vertebral articulations 0: platycoelous or amphicoelous; 1: formed: concavo-convex.
21. Transverse process of cervicals 0: on middle of centrum; 1: on anterior of centrum.
22. Posterior cervicals with 0: no ventral process; 1: ventral process.
23. Cervical ribs 0: present; 1: absent.
24. Cervical 4 0: amphicoelous 1: biconvex; 2: opisthocoelous.
25. Cervical 8 0 amphicoelous; 1 procoelous; 2; biconvex; 3: opisthocoelous.
26. Double articulation between cervicals 7 and 8 0: no; 1: yes.
27. Transverse processes on cervicals 0: double; 1: single.
28. Spine on cervical 8 0: high; 1: low.
29. Biconcave caudal 0: absent; 1: present.
30. Caudal centra 0: amphicoelous or opisthocoelous; 1: procoelous.
31. Chevrons 0: well developed; 1: small or absent.

32. First thoracic rib 0: extends to peripherals; 1: fails to reach peripherals.  
 33. First thoracic centrum, 0: faces anteriorly; 1: faces strongly anteroventrally.  
 34. Mesoplastra 0: present; 1: absent.  
 35. Ligamentous carapace-plastron attachment 0: no, sutured; 1: yes.  
 36. Supramarginal scales 0: present; 1: absent.  
 37. Dorsal process on epiplastron 0: present; 1: absent.  
 38. Entoplastron separating epiplastron 0: yes; 1: no, epiplastra broadly contact.  
 39. Epiplastron 0: broad; 1: narrow.  
 40. Gular (extragular) scales 0: present, full set; 1: absent, one set.  
 41. Carapace greater than 30 cm long 0: no; 1: yes.  
 42. Neural shape 0: rectangular; 1: hexagonal.  
 43. Distance between antero-lateral tip of hyoplastron and postero-lateral tip of hypoplastron 0: much greater than bridge; 1: much shorter than bridge 2: subequal to the length of the bridge.

## Data matrix

<i>Proganochelys</i>	00000 00000 00?00 00000 00000 00000 00000 00000 000
<i>Kayentachelys</i>	00110 01000 00?00 00000 00000 00?00 00000 10000 002
<i>Kallokibotion</i>	00110 11100 0000? 00000 00000 00?00 00000 1010 012
Pleurosternidae	00110 11110 10011 01000 00000 00?00 00000 10100 112
Baenidae	00110 11110 10111 01000 00000 01000 00000 11100 112
Plesiochelyidae	01110 11111 00000 01000 00100 01?00 00010 11100 012
<i>Xinjiangchelys</i>	?1?? ?1111 0000? ?1??0 10000 000?? ?1011 11100 100
Meiolaniidae	00110 11111 01?00 00001 00011 00000 00011 10100 1?2
<i>Otwayemys</i>	????? ???? ???? ????01 00?12 000?0 00011 11100 0?0
<i>Sinemys</i>	00111 11111 00000 11111 10022 01?11 00011 11111 000
<i>Dracochelys</i>	?1111 11111 00?0? 111?1 00022 0?0?? ?0011 11111 000
<i>Hangaiemys</i>	01111 11111 1100? 11001 11111 010?? ?1011 11111 000
<i>Ordosemys</i>	00110 11111 0000? 11101 10012 00011 00011 101?? 000
<i>Judithemys</i>	?1?10 11111 1100? 11??1 11111 01011 11011 11111 110
<i>Aurorachelys</i>	????? ???? ???? ???? ???? ???? ???? ???? ???? 110
Chelydridae	11110 11111 11100 01101 11111 01111 01111 11111 011
Chelonioidae	01110 11111 11000 01101 11111 11101 11111 11111 111
Trionychoidea	11110 11111 11000 01111 11111 11101 11110 11100 012
Testudinoidea	11110 11111 11100 01111 11112 11101 11110 11101 012

## Data Repository References

Bohlin, B., 1953, Fossil reptiles from Mongolia and Kansu. Report from the Scientific Expedition to the Northwest Provinces of China under the leadership of Dr. Sven Hedin. *Sino Swedish Expedition Publication*, v. 37, p. 1-113.

Brinkman D.B., & Peng,, J.-H., 1993a, *Ordosemys leios*. n. gen., n. sp., a new turtle from the Early Cretaceous of the Ordos basin, Inner Mongolia. *Canadian Journal of Earth Sciences*, v. 30, p. 2128–2138.

Brinkman, D. B. & Peng, J. H., 1993b, New material of *Sinemys* (Testudines, Sinemydidae) from the Early Cretaceous of China. *Canadian Journal of Earth Sciences* , v. 30, p. 2139-2152.

Danilov I. G., A. O. Averianov, P. P. Skutchas, and A. S. Rezvyi. 2006. *Kirgizemys* (Testudines, Macrobaenidae): new material from the Lower Cretaceous of Buryatia (Russia) and taxonomic revision; pp. 46–62 in I. G. Danilov, and J. F. Parham (eds.), *Fossil Turtle Research. Russian Journal of Herpetology. 13(Suppl.):1.* Zoological Institute of Russian Academy of Sciences, St. Petersburg.

Danilov I. G., Sukhanov V. B. 2006. Redescription of «*Sinemys*» efremovi, a problematic turtle from the Early Cretaceous of China, with comments on the basal eucryptodiran genus *Wuguia*. *Acta Palaeontologica Polonica* v. **51**, p. 105–110.

Danilov I. G., Parham J. F. 2007. The type material of «*Sinemys*» wuerhoensis, a problematic turtle from the Early Cretaceous of China, includes at least three taxa. *Palaeontology*, v. **50**, p. 431–444.

Endo, R. & Shikama, R., 1942, Mesozoic fauna in the Jehol Mountain land, Manchoukouo. *Bulletin of Central National Museum, Manchoukuo* , v. **3**, p. 1-22.

Gaffney, E. S. & Ye. X.-K., 1992, *Dracochelys*, a new cryptodiran turtle from the Early Cretaceous of China. *American Museum Novitates* , v. **3048**, p. 1-13.

Holroyd P. A., & Hutchison, J.H., 2002, Patterns of geographic variation in latest Cretaceous vertebrates: evidence from the turtle component. *GSA Special Paper*. v. **361**, p. 177–190.

Hutchison J. H., & Archibald, J.D., 1986, Diversity of turtles across the Cretaceous/Tertiary boundary in northeastern Montana. *Palaeogeography, Palaeoclimatology, Palaeoecology*, v. **55**, p. 1–22.

Hutchison J. H., & Holroyd, P.A., 2003, Late Cretaceous and early Paleocene turtles of the Denver Basin, Colorado. *Rocky Mountain Geology*, v. **38**, p. 121–142.

Hutchison, J. H., & Weems, R.E., 1999, Paleocene turtle remains from South Carolina. *Transactions of the American Philosophical Society* , v. **88**, p. 165–195.

Ji., S.-A., 1995, Reptiles. in *Faunae and stratigraphy of Jurassic-Cretaceous in Beijing and the adjacent areas*, (eds. Ren, D., Lu, L.-W., Guo, Z.-G., & Ji, S.-A.) 10-146 (Seismic Press, Beijing).

Khuzatskii, L. I., 1996, New turtle from the Early Cretaceous of central Asia. *Russian Journal of Herpetology* , v. **3**, p. 89-94.

Khuzatskii L.I., & Nesov, L.A., 1977, Turtles of the genus *Adocus* from the Late Cretaceous of the SSSR. *Trudy Zoologicheskogo Instituta AN SSSR*, v. **74**, p. 116–118.

Khuzatskii L.I., & Nesov, L.A., 1979, Large turtles of the Late Cretaceous of Middle Asia. *Trudy Zoologicheskogo Instituta AN SSSR*, v. **89**, p. 98–108.

Maisch, M. W., Matzke, A. T., & Sun, G., 2003, A new sinemydid turtle (Reptilia: Testudines) from the Lower Cretaceous of the Junggar Basin (NW-China). *Neues Jarhbuch für Geologie und Paläontologie Monatshefte*, v. **12**, p. 705-722.

Matzke, A. T., Maisch, M. W., Pfretzschner, H. –U., Sun, G., & Stohr, H., 2004, A new basal sinemydid turtle (Reptilia: Testudines) from the Lower Cretaceous Tugulu Group of the Junggar Basin (NW China) *Neues Jarhbuch für Geologie und Paläontologie Monatshefte*, v. **3**, p. 151-167.

McKenna M. C., J. H. Hutchison, & J. H. Hartman, 1987, Paleocene vertebrates and nonmarine mollusca from the Goler formation, California, in *Basin Analysis and Paleontology of the Paleocene and Eocene Goler Formation, El Paso Mountains, California*, (ed. Cox, B.F.) 31–41(Society of Economic Paleontologists and

Mineralogists, Pacific Section, Los Angeles).

Narmandakh P., 2000, New genus of turtle from lower Cretaceous deposit of Mongolia, *Batoremys*, in *Results of the Hayashibara Museum of Natural Sciences—Mongolian Academy of Sciences—Mongolian Paleontological Center Joint Paleontological Expedition* (eds. Ishii, K.I., Watabe, M., Suzuki, S., Ishigaki, S., Barsbold, R., & Tsogtbaatar, K.) 134–135 (Hayashibara Museum of Natural Sciences Research Bulletin Vol. 1., Hayashibara Museum of Natural Sciences, Okyama).

Nesov, L.A. & Khozatskii, L.I., 1981, [Early Cretaceous Turtles of Transbaikal]. [*Herpetological research in Siberia and the Far East*]. (ed. Borkin, L.J.) 74-78 (Zool. Inst. Acad. Sci. USSR, Leningrad).

Parham, J. F., 2005, A reassessment of the referral of sea turtle skulls to the genus *Osteopygis* (Late Cretaceous, New Jersey, USA), *Journal of Vertebrate Paleontology*, v. **25**, p. 71–77.

Parham, J. F., & Hutchison, J.H., 2003, A new eucryptodiran turtle from the Late Cretaceous of North America (Dinosaur Provincial Park, Alberta, Canada). *Journal of Vertebrate Paleontology*, v. **23**, p. 783–798.

Russell L. S. 1934, Fossil turtles from Saskatchewan and Alberta. *Transactions of the Royal Society of Canada, Series 3, Section IV*, v. **28**, p. 101–110.

Sukhanov V.B., 2000, Mesozoic turtles of Middle and Central Asia. in *The age of dinosaurs in Russia and Mongolia* (eds. Benton, M.J., Shishkin, M.A., Unwin, D.M., & Kurochkin, E.N.) 309–367 (Cambridge University Press, Cambridge).

Sukhanov V.B., & Narmandakh, P., 1974, A new Early Cretaceous turtle from continental deposits of the northern Gobi. The joint Soviet-Mongolian Paleontological Expedition. *Transactions Mesozoic and Cenozoic faunas and biostratigraphy of Mongolia*, v. **1**, p. 192–220.

Tatarinov L.P., 1959, New turtle of the family Baenidae from the Lower Eocene of Mongolia. *Paleontologicheskii Zhurnal*, v. **1**, p. 100–113.

Tong, H.-Y., Ji, S.-A., & Ji, Q., 2004, *Ordosemys* (Testudines: Cryptodira) from the Yixian Formation of Liaoning Province, Northeastern China: New Specimens and Systematic Revision. *American Museum Novitates*, v. **3438**, p. 1-9.

Weems, R.E., 1988, Paleocene turtles from the Aquia and Brightseat formations, with a discussion of their bearing on sea turtle evolution and phylogeny. *Proceedings of the Biological Society of Washington*, v. **101**, p. 109–145.

Wiman,C., 1930, Fossile Schildkröten aus China. *Paleontologica Sinica (C)*, v. **6**, p. 1-56.

Ye, X.-K., 1973, Chelonia fossils from Wuerho. *Memoirs of the Institute of Vetebrate Paleontology and Paleoanthropology, Academia Sinica*. v. **11**, p. 8-11.

**Supplementary Table DR1: North American Macrobaenid Turtles (Late Cretaceous and Paleogene)**

Form	Area	Reference	Location
<i>Osteopygis emarginatus</i>	South Carolina	Hutchison and Weems, 1999	33.72° N, 79.92° W
<i>Osteopygis emarginatus</i>	Maryland	Weems, 1988	38.83° N, 76.85° W
<i>Osteopygis emarginatus</i>	New Jersey	Parham, 2005	39.76° N, 75.16° W
<i>Judithemys sukhnovi</i>	Dinosaur Provincial Park	Parhma and Hutchison, 2003	50.76° N, 111.49° W*
“ <i>Clemmys</i> ” <i>backmani</i>	Saskatchewan	Russell, 1934	49° N, 105° W*
“ <i>Clemmys</i> ” <i>backmani</i>	Montana	Hutchison and Archibald, 1986	47.28° N, 106.99° W 47.65° N, 105.79° W
“ <i>Clemmys</i> ” <i>backmani</i>	North Dakota	Holroyd and Hutchison, 2002	46.45° N, 103.46° W
“ <i>Clemmys</i> ” <i>backmani</i>	Wyoming	Holroyd and Hutchison, 2002	43.06° N, 104.48° W
Macrobaenids	Colorado	Hutchison and Holroyd, 2003	39.35° N, 104.42° W
	California	McKenna et al., 1987	35.34° N, 118.73° W
	Wyoming	Holroyd et al., 2001	43.84° N, 104.57° W

\* indicates approximate locations

**Supplementary Table DR2: Asian Macrobaenid Turtles (Late Cretaceous and Paleogene)**

Form	Area	Reference	Location
<i>Anatolemys oxensis</i>	Uzbekistan	Khozatski and Nessov, 1977, 1979	46° N, 64° E*
<i>Anatolemys maximus</i>	Tadzhikistan	Khozatski and Nessov, 1977, 1979	40° N, 67°E*
<i>Anatolemys</i> sp.	Kazakhstan	Khozatski and Nessov, 1977, 1979	47°N, 70°E*
<i>Macrobaena mongolica</i>	Naran Bulak	Tartarinov, 1959	43° N, 100° E*

\* indicates approximate locations

**Supplementary Table DR3: Asian Macrobaenid Turtles (Early Cretaceous)**

Form	Area	Reference	Location
<i>Kirgizemys hoburensis</i>	Mongolia	Sukhanov and Narmandakh, 1974; Danilov et al., 2006	46° N, 105° E*
<i>Kirgizemys hoburensis</i>	Mongolia	Sukhanov, 2000; Danilov et al., 2006	40° N, 98° E*
<i>Kirgizemys dmitrievi</i>	Buryatia	Nessov and Khozatski, 1981	50° N, 107° E*
<i>Kirgizemys exaratus</i>	Kirgizstan	Nessov and Khozatski, 1981	41° N, 68° E*
<i>Kirgizemys kansuensis</i>	Gansu	Bohlin, 1953; Danilov et al., 2006	35°N, 104°W*
“ <i>Batoremys</i> ”	Mongolia	Narmandakh, 2000	46° N, 108° E*
<i>Ordosemys leios</i>	Inner Mongolia	Brinkman and Peng, 1993a	30° N, 110° E*
<i>Ordosemys liaoxiensis</i>	Liaoning	Ji, 1995; Tong, Ji, and Ji 2004.	40° N, 116° E*
<i>Ordosemys brinkmania</i>	Xinjiang	Ye, 1973; Danilov and Parham, 2007	46°N, 86°W
<i>Dracochelys bicuspis</i>	Xinjiang	Gaffney and Ye, 1992	47°N, 86°W*
<i>Wuguia hutubeiensis</i>	Xinjiang	Matzke and Maisch, 2004	43°N, 88°W*
<i>Wuguia efremovi</i>	Xinjiang	Khozatsky, 1996; Danilov and Sukhanov, 2006	43°N, 87°W*
<i>Wuguia efremovi</i>	Xinjiang	Maisch, Matzke and Sun, 2003; Danilov and Sukhanov, 2006	44°N, 87°W*
<i>Manchurochelys manchouensis</i>	Liaoning Province	Endo et Shikama, 1942	42°N, 122°W*
<i>Sinemys lens</i>	Shandong	Wiman, 1930	36°N, 118°W*
<i>Sinemys gamera</i>	Inner Mongolia	Brinkman and Peng, 1993	30° N, 110° E*

\* indicates approximate locations