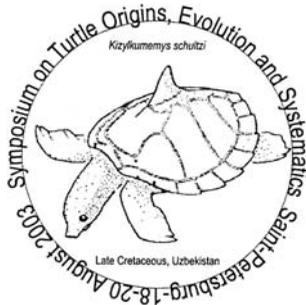


FOSSIL TURTLE RESEARCH

VOLUME 1

Proceedings of the Symposium on Turtle Origins, Evolution and Systematics

August 18 – 20, 2003,
St. Petersburg, Russia



Edited by
Igor G. Danilov and James F. Parham

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**Cover photo: PIN 52-1a, holotype of *Yaxartemys longicauda* Riabinin, 1948,
Upper Jurassic of Kazakhstan, Karatau Ridge, vicinity of Mikhailovka village
Photograph: Igor Danilov**

***Kirgizemys* (TESTUDINES, ‘MACROBAENIDAE’): NEW MATERIAL FROM THE LOWER CRETACEOUS OF BURYATIA (RUSSIA) AND TAXONOMIC REVISION**

Igor G. Danilov¹, Alexander O. Averianov¹, Pavel P. Skutchas² and Anton S. Rezvyi³

A new specimen of *Kirgizemys dmitrievi*, including parts of the shell, first known skull, and some non-shell postcrania, comes from the type area of the species: Gusinoe Lake, Buryatia, Russia; Lower Cretaceous (Barremian – Aptian), Murtoi Formation. Our study of new specimen, previously collected materials, and published data lead us to the conclusion that *Kirgizemys* Nesson and Khosatzky, 1973 is a subjective senior synonym of *Hangaiemys* Sukhanov and Narmandakh, 1974. A new diagnosis for *Kirgizemys* is given. As construed here, *Kirgizemys* includes five species: *K. exaratus* Nesson and Khosatzky, 1973 (type species), from the Albian of Kyrgyzstan, *K. dmitrievi* Nesson and Khosatzky, 1981 from the Barremian-Aptian of Transbaikalia, Russia, *K. hoburensis* (Sukhanov and Narmandakh, 1974) from the Aptian-Albian of Mongolia, *K. kansuensis* (Bohlin, 1953) from the Early Cretaceous of China and *K. leptis* (Sukhanov and Narmandakh, 2006) from the Albian of Mongolia.

INTRODUCTION

Kirgizemys Nesson and Khosatzky, 1973 is a poorly known shell-based ‘macrobaenid’ genus from the Early Cretaceous of Asia (Sukhanov, 2000; Parham and Hutchison, 2003). The type species of *Kirgizemys*, *K. exaratus* Nesson and Khosatzky, 1973, from the Albian of Kyrgyzstan is based on shell fragments (Nesson and Khosatzky, 1978). The second species of the genus, *Kirgizemys dmitrievi* Nesson and Khosatzky, 1981 from the Barremian-Aptian of Buryatia, is based on even fewer remains (Nesson and Khosatzky, 1981; Skutchas, 2001). According to shell characters, *Kirgizemys* is considered most closely related to the genus *Hangaiemys* Sukhanov and Narmandakh,

1974 (Sukhanov and Narmandakh, 1974; Nesson and Khosatzky, 1978; Sukhanov, 2000). Unlike *Kirgizemys*, the type species of *Hangaiemys*, *H. hoburensis* Sukhanov and Narmandakh, 1974, is represented by series of complete shells and skulls from the Lower Cretaceous (?Aptian-Albian) of Mongolia, although skull of *Hangaiemys* is only preliminary described (Sukhanov, 2000; Egorova, 2004b). Differences between *Kirgizemys* and *Hangaiemys* are not clear, however, and a similar species *Osteopygis kansuensis* Bohlin, 1953 from the Early Cretaceous of China (Bohlin, 1953) was placed either in *Kirgizemys* (Nesson and Khosatzky, 1978) or *Hangaiemys* (Sukhanov and Narmandakh, 1974; Shuvalov and Chkhikvadze, 1979; Sukhanov, 2000; Parham and Hutchison, 2003). Moreover, *Kirgizemys dmitrievi* shares some features with *Hangaiemys* and Skutchas (2001) questioned its attribution to *Kirgizemys*. Finally, according to Sukhanov and Narmandakh (2006), *Hangaiemys* includes one more species *H. leptis* Sukhanov and Narmandakh, 2006 from the Albian of Mongolia.

In 2002, a new specimen of *Kirgizemys dmitrievi* (ZIN PH 7/15) that includes a skull, part of the shell, and some non-shell postcrania was collected by the

¹ Zoological Institute of Russian Academy of Sciences, Universitetskaya Emb. 1, St. Petersburg, 199034, Russia. E-mail: dig@mail333.com

² Department of Vertebrate Zoology, St. Petersburg State University, Universitetskaya Emb. 7/9, St. Petersburg, 199034, Russia

³ Laboratory of Paleontology, St. Petersburg State University, 16 Liniya 29, 199178, Russia

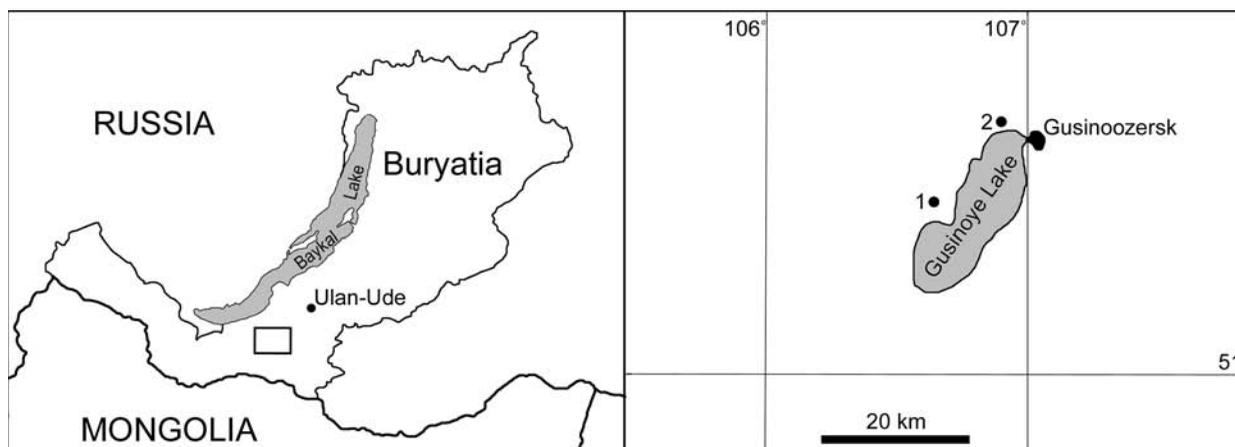


Fig. 1. Map of *Kirgizemys dmitrievi* localities: 1 – Mogoito, type locality of the species; 2 – Gusinozersk 1 locality.

expedition of the Zoological Institute of Russian Academy of Sciences. The specimen was found at the type area of this species, Gusinozersk 1 locality, near Gusinozersk city on the north coast of Gusinoe Lake in Buryatia, Russia (Fig. 1), in beds of the Lower Cretaceous (Barremian – Aptian) Murtoi Formation. This specimen sheds new light on the *Kirgizemys* morphology and *Kirgizemys/Hangaiemys* relationship. The aim of this paper is to describe the new specimen and propose a new taxonomic arrangement for the genus *Kirgizemys*. Danilov et al., (2003) and Egorova (2004a) published some preliminary results of this study. We conclude *Kirgizemys* and *Hangaiemys* are not generically distinct and suggest species of *Hangaiemys* be referred to *Kirgizemys* because of priority of the latter taxon name.

Institutional abbreviations – PIN, Paleontological Institute of Russian Academy of Sciences, Moscow; ZIN PH (= ZIN PHT), Zoological Institute of Russian Academy of Sciences paleoherpetological collection, St. Petersburg.

DESCRIPTION

Skull – The skull of ZIN PH 7/15 (Figs 2-4) is missing its right anterolateral part and is seriously deformed. The right half of the skull is displaced

backwards and its posterior part is laterally compressed, resulting in a constriction of the upper temporal emarginations. The estimated width of the skull on the level of mandibular condyles is about 90% of its length (from tip of the snout to occipital condyle). Its height on the level of mandibular condyles is about 60% of its length. Viewed from above, the anterior half of the skull narrows towards the snout, whereas its posterior half has parallel lateral borders possibly due to deformation. A single orbit, preserved on the right side, occupies the anterior third of the skull and is directed anterolaterally, forming an angle of about 30° with midline of the skull. As preserved, the orbit is oval-shaped with its long axis directed dorsoventrally. It appears that the orbit was more rounded prior to deformation. The upper temporal emargination occupies less than a third of the skull length, almost reaching the anterior edge of the otic capsule. In lateral view, the skull is relatively high, gradually lowering anteriorly from the supraoccipital crest to the middle of the orbit and more sharply from the latter to the tip of the snout. We regard this shape to be the result of deformation. The lower temporal emargination is well developed, reaching the lower half of the orbit. In general, before the deformation the skull was probably more triangular shaped in dorsal view

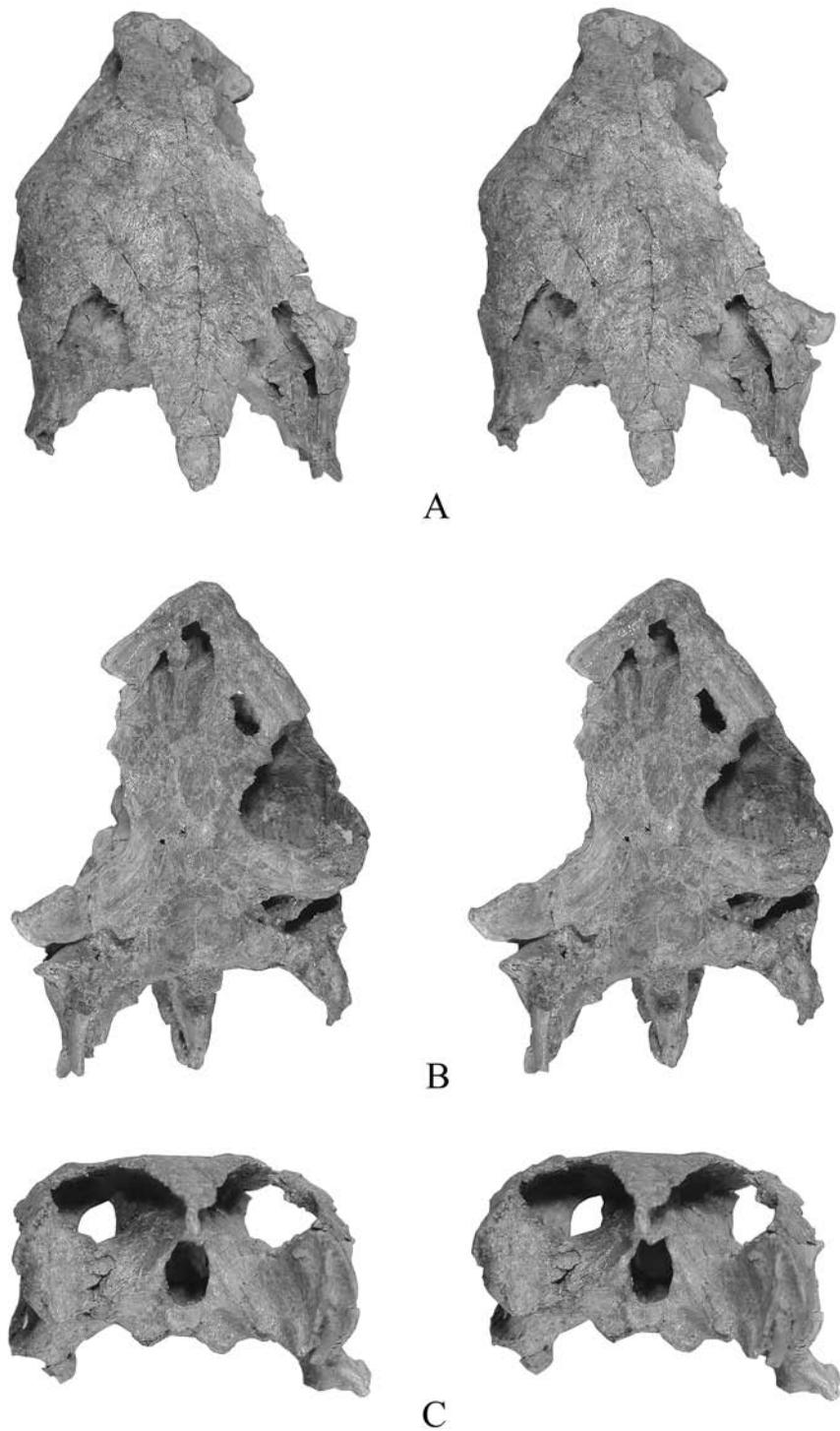


Fig. 2. Stereophotographs of the skull of *K. dmitrievi*, ZIN PH 7/15: A – dorsal view; B – ventral view; C – posterior view.
For scale see Fig. 4.

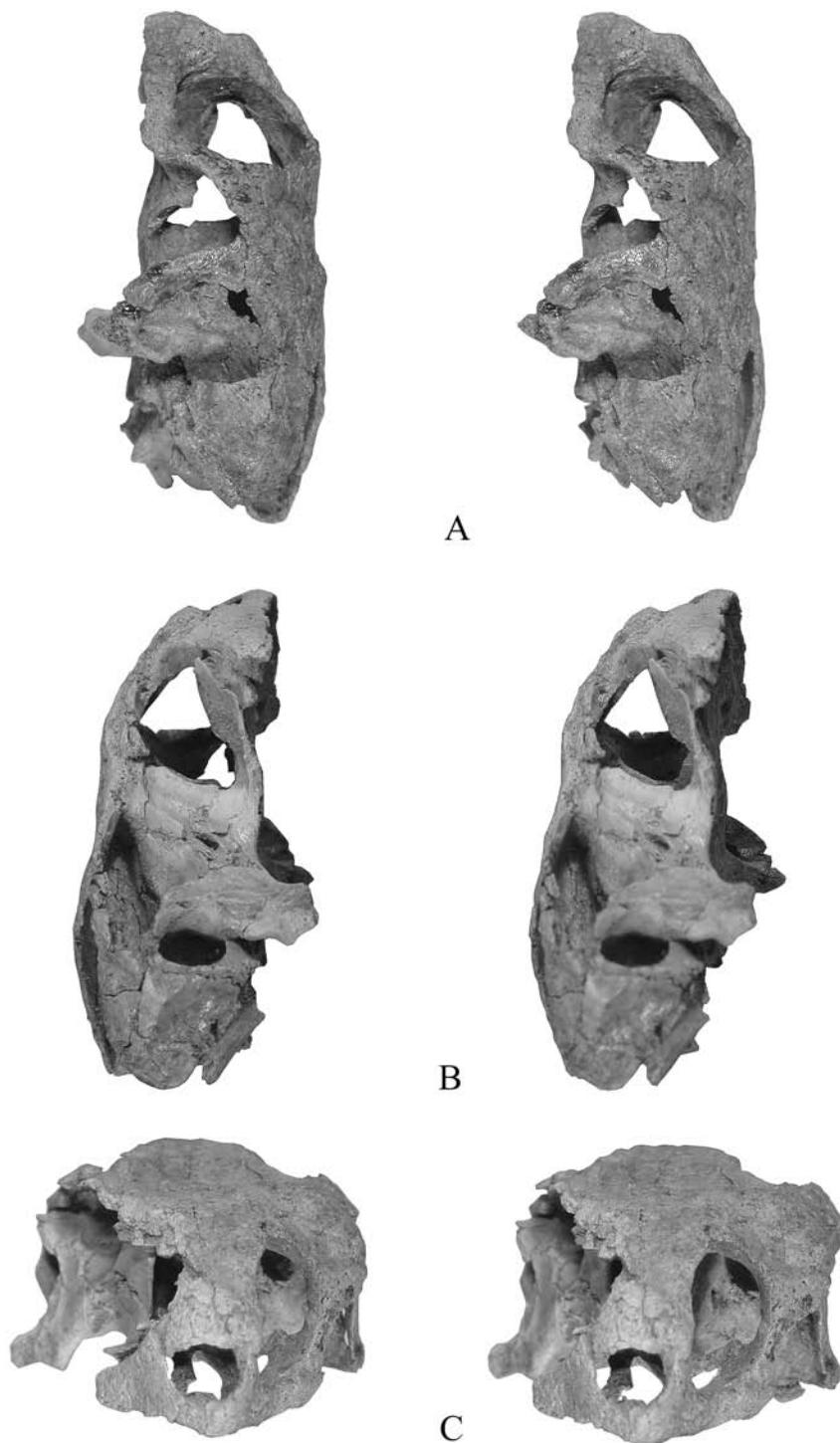


Fig. 3. Stereophotographs of the skull of *K. dmitrievi*, ZIN PH 7/15: A – left view; B – right view; C – anterior view.
For scale see Fig. 4.

and with a more gradual anterior slope, similar to *Hangaimeys hoburensis*.

Most bones of the skull roof are better preserved on the left side of the skull.

The nasals are missing, although a small notch in the anterior border of prefrontals may indicate that they were present. If so, the nasals were very small triangular elements similar to those in *H. hoburensis*.

The prefrontal borders the anterodorsal edge of the orbit. The two prefrontals contact one another at the midline and are not separated by frontals as in *Ordosemys* Brinkman and Peng 1993a (Brinkman and Wu, 1999) and *Sinemys* Wiman, 1930 (Brinkman and Peng, 1993b). The position of the prefrontal–maxilla contact is not clear. The prefrontal contacts the palatine posteriorly and the vomer medially.

The frontals are relatively small, lie between the prefrontal and postorbital, contribute to the border of the orbit laterally, and contact the parietal posteriorly. In general shape and size the frontal of ZIN PH 7/15 resembles that in *H. hoburensis*.

The parietal makes up most of the skull roof. It contacts the frontal anteriorly, the postorbital laterally and the supraoccipital posteriorly. It is unknown whether the parietal contacts squamosal or not. The lateral border of the parietal is convex. The descending process of the parietal contacts the prootic and the epipterygoid and forms the dorsal border of the foramen nervi trigemini. A process of the parietal extends posterior to the

foramen nervi trigemini to contact the quadrate and questionally pterygoid, excluding the prootic from the edge of this foramen. This condition is also known in *Ordosemys* and *H. hoburensis*.

The jugal forms a narrow bar that extends from the maxilla to the postorbital. Medially the jugal contacts the pterygoid. The jugal in ZIN PH 7/15 is a narrow bar in lateral view, most similar in shape to *H. hoburensis*.

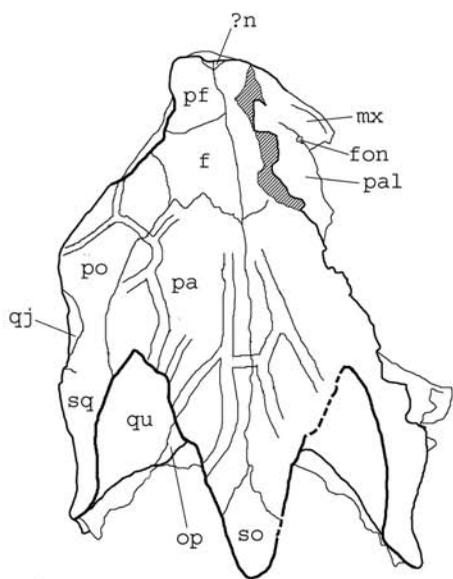
The quadratojugal is a C-shaped element that articulates with the postorbital dorsally and the quadrate posteriorly. Anteriorly, the quadratojugal almost reaches the jugal, but appears to be separated from it by the postorbital. The quadratojugal in ZIN PH 7/15 differs from those in *Ordosemys* in having a less developed anterior process and the absence of a contact with the jugal. The quadratojugal is not known in *H. hoburensis*.

The postorbital is a large element. It forms the posterodorsal border of the orbit anteriorly between the frontal and jugal and contacts the parietal medially and the quadratojugal and squamosal posteriorly. The suture between the postorbital and squamosal is not visible thus is uncertain whether the postorbital enters the margin of the upper temporal emargination.

The squamosal contacts the postorbital anteriorly, the quadrate ventrally and the prootic and opisthotic medially. The contact with the parietal is unknown for the reasons given above.

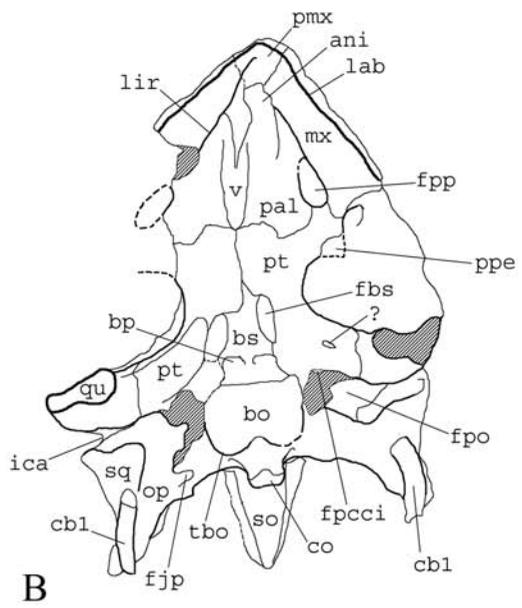
The scute sulci are visible on the surface of the skull roof, although their pattern is not completely clear. Scute sulci on the skull roof, although,

Fig. 4. The skull of *K. dmitrievi*, ZIN PH 7/15: A – dorsal view; B – ventral view; C – left view; D – right view; E – anterior view; F – posterior view. Broken areas are hatched. Double lines show scute sulci. Abbreviations: **ani**, apertura narium interna; **apo**, antrum postoticum; **bo**, basioccipital; **bp**, basisphenoid pit; **bs**, basisphenoid; **cb**, cornu branchiale; **co**, condylus occipitalis; **eso**, crista supraoccipitalis; **ept**, epipterygoid; **exo**, exoccipital; **f**, frontal; **fbs**, foramen basisphenoidale; **fjp**, foramen jugulare posterius; **fm**, foramen magnum; **fn**, fossa nasalis; **fnh**, foramina nervi hypoglossi; **fnt**, foramen nervi palatini; **fon**, foramen orbito-nasale; **fpcci**, foramen posterior canalis carotici interni; **fpo**, fenestra postotica; **fpp**, foramen palatinum posterius; **ica**, incisura columella auris; **j**, jugal; **lab**, labial ridge; **lir**, lingual ridge; **mpj**, medial process of jugal; **mx**, maxilla; **?n**, place for nasal; **op**, opisthotic; **pa**, parietal; **pal**, palatine; **pf**, prefrontal; **pip**, processus inferior parietalis; **pmx**, premaxilla; **po**, postorbital; **ppe**, processus pterygoideus externus; **pr**, prootic; **pt**, pterygoid; **pto**, processus trochlearis oticum; **qj**, quadratojugal; **qu**, quadrate; **so**, supraoccipital; **sq**, squamosal; **tbo**, tuberculum basioccipitale; **v**, vomer.

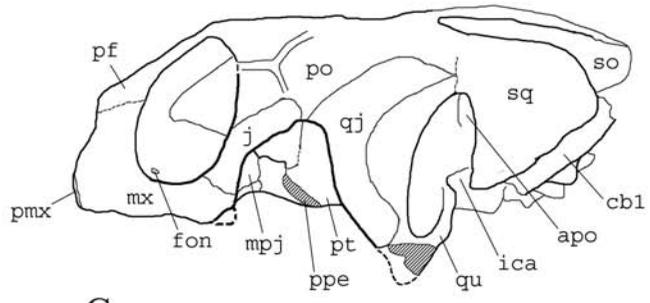


A

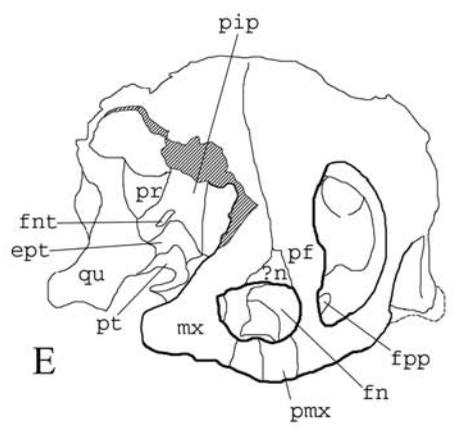
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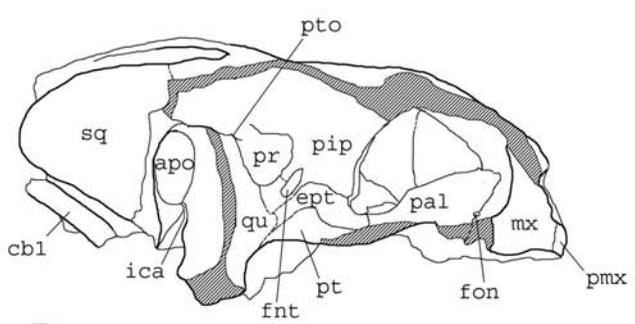
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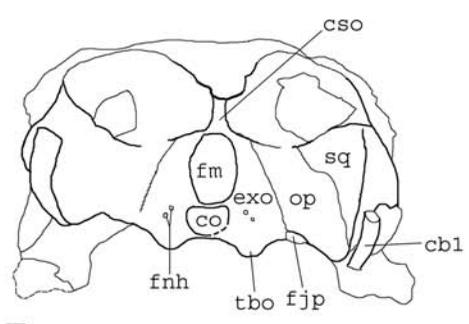
C



E



D



F

somewhat different from ZIN PH 7/15, are known among ‘macrobaenids’ in *H. hoburensis* (Sukhanov, 2000, fig. 17.10) and *Judithemys sukhanovi* Parham and Hutchison, 2003.

Both premaxillae are preserved with well developed labial ridges and a shallow commissural depression. The foramen praepalatium is not visible due to poor preservation.

The left maxilla is complete and the right one is missing its posterior half. The lateral portion of the maxilla forms the anterolateral and suborbital portion of the facial region of the skull. The palatal surface of the maxilla forms the triturating surface. The triturating surface is moderately wide and narrows slightly anteriorly. The labial ridge is well developed and smooth, without projections and notches. The lingual ridge is very shallow. The maxilla contacts the premaxilla and vomer anteriorly, the palatine medially, and the pterygoid and jugal posteriorly. The maxilla borders the apertura narium interna between the vomer and palatine and forms the lateral margin of the foramen palatinum posterius. This opening is moderately large and oval-shaped. In *Dracocheilus bicuspis* Gaffney and Ye, 1992, the foramen palatinum posterius is larger and subtriangular in shape. In *H. hoburensis* it is reported as large (Sukhanov, 2000), although its certain shape and size is unclear (Egorova, 2004b; IGD, pers. obs.). In *Ordosemys* this opening is moderately large and the maxilla either forms only small part of its lateral border or is separated from it. The foramen orbito-nasale in ZIN PH 7/15 is very small and located at the

suture between the maxilla and the palatine as in *H. hoburensis*.

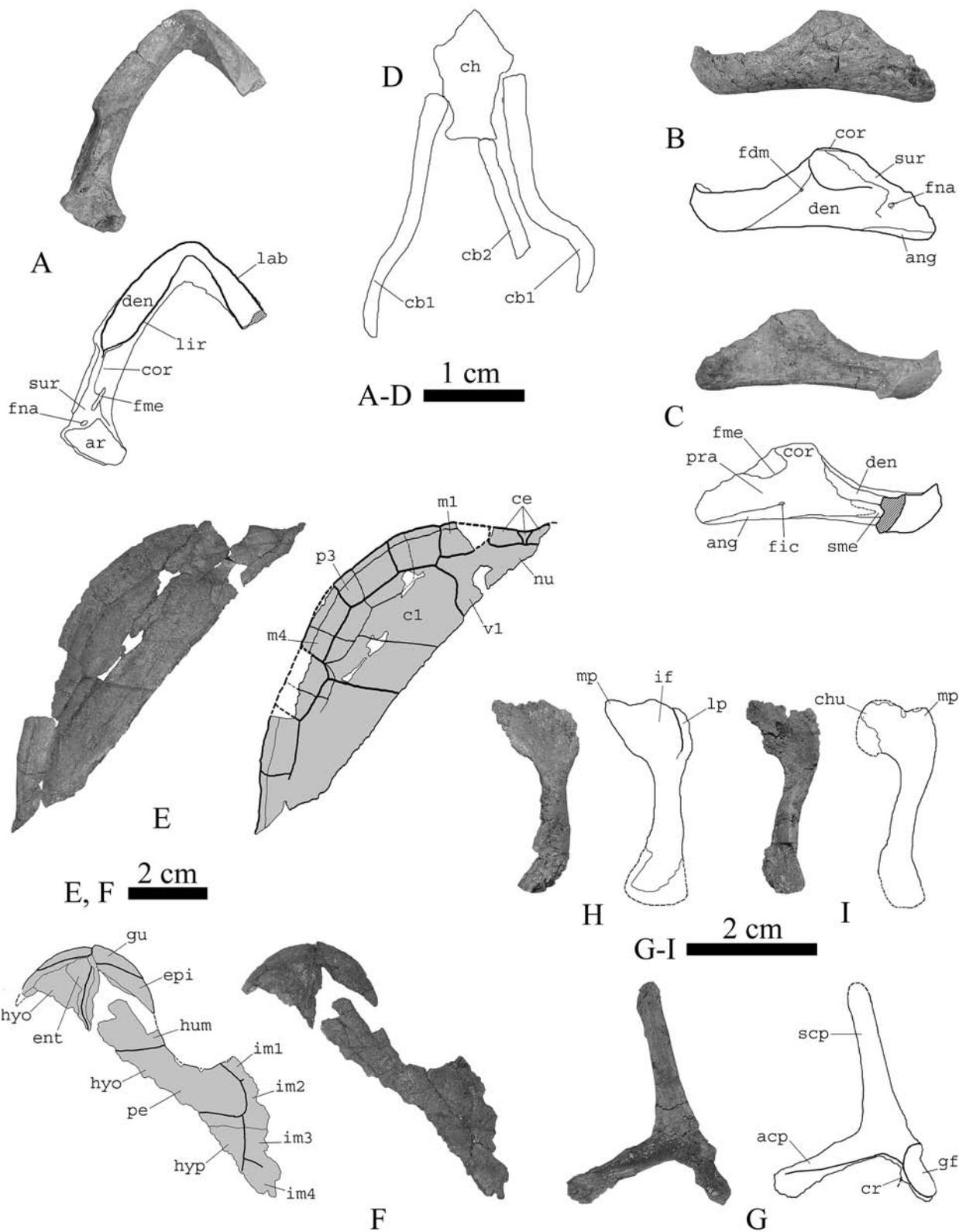
The vomer is damaged anteriorly. The internarial septum is narrow although not reaching the pterygoids. Contacts of the vomer with the palatine and pterygoids are clearly visible.

The palatine roofs the apertura narium interna and contacts the prefrontal anteriorly, the vomer medially, the maxilla laterally, and the pterygoid posteriorly. The palatine also forms the medial margins of the foramen palatinum posterius and the foramen orbito-nasale.

Both pterygoids are present, although missing their external processes. The general shape of the pterygoids is similar to those in *Ordosemys* and *H. hoburensis*. Their anterior border forms a blunt projection medially. The pterygoid contacts the palatines and vomer anteriorly, the maxilla and jugal anterolaterally, the basisphenoid and basioccipital posteromedially, the quadrate posterolaterally and the prootic, epipterygoid and parietal dorsally. The pterygoid forms the posterior margin of the foramen palatinum posterius, lateral border of the foramen basisphenoidale and anterior border of the fenestra postotica. As in other ‘macrobaenids’ and some other cryptodires, a distinct concavity is present on the ventral surface of the quadrate ramus of the pterygoid. A small foramen is visible in this concavity on the left pterygoid.

The quadrate forms the lateral margin of the foramen stapedio-temporale and meets the prootic along the medial edge of the processus trochlearis oticum. Thus, the processus trochle-

Fig. 5. The lower jaw (A–C), hyoid apparatus (D), shell (E, F), and postcranial (G–I) elements of *K. dmitrievi*, ZIN PH 7/15: A–C – the lower jaw in dorsal (A); lateral (B) and medial (C) views; D – the hyoid apparatus in ventral view (reconstruction); E – fragment of carapace in dorsal view; F – fragment of plastron in ventral view; G – shoulder girdle in lateral view; H, I – left humerus in ventral (H) and posterior (I) views. Broken areas are hatched. Abbreviations: **acp**, acromial process of scapula; **ce**, cervical scute; **ang**, angular; **ar**, articular; **c**, costal; **ch**, corpus hyoidei; **chu**, caput humeri; **cor**, coronoid; **cr**, coracoid; **den**, dentary; **ent**, entoplastron; **epi**, epiplastron; **fdm**, foramen dentofaciale majus; **fic**, foramen intermandibularis caudalis; **fme**, fossa meckelii; **fna**, foramen nervi auriculotemporalis; **gf**, glenoid fossa; **gu**, gular scute; **hum**, humeral scute; **hyo**, hyoplastron; **hyp**, hypoplastron; **im**, inframarginal scute; **lp**, lateral process; **mp**, medial process; **m**, marginal scute; **nu**, nuchal; **p**, peripheral; **pe**, pectoral scute; **pra**, prearticular; **scp**, scapular process of scapula; **sme**, sulcus meckelii; **sur**, surangular; **v**, vertebral scute. For other abbreviations see Fig. 4.



aris oticum is formed mainly by the quadrate. The cavum tympani is circular in lateral view with a distinct dorsoventrally elongated depression in its posterior part. The incisura columellae auris is open posteriorly.

The epipterygoid is observable on the right side of the skull. It is situated between the parietal and pterygoid and forms the posteroventral border of the foramen interorbitale. The epipterygoid is separated from the foramen nervi trigemini by the contact of the parietal and pterygoid.

The supraoccipital is completely preserved. The supraoccipital spine is short; extending only slightly beyond the level of the posterior tips of the squamosals.

The sutures between the exoccipitals and basioccipital are not discernable. The exoccipital forms the lateral borders of the foramen magnum, meeting the supraoccipital dorsally and the opisthotic laterally. The foramen jugulare posterius is visible on the right side of the skull and represented by a notch at the ventral part of the exoccipital–opisthotic suture. A pair of foramina nervi hypoglossi are visible on the posterior surface of the exoccipital lateral to the occipital condyle.

The basioccipital is wider than the posterior end of the basisphenoid and has a slightly concave ventral surface. The occipital condyle is located at a distinctly higher level than this surface. The posterolateral edges of the basioccipital form a pair of transversely oriented basioccipital tubercles.

The prootic forms the anterior margin of the foramen stapedio-temporale and the medial border of the processus trochlearis oticum similar to that in *H. hoburensis*. In *Dracochelys bicuspis* and *Ordosemys* the processus trochlearis oticum is formed mainly by the prootic.

The opisthotic forms the posterior margin of the foramen stapedio-temporale and contacts the quadrate and squamosal laterally and the exoccipital medially. Other contacts of the opisthotic are not clear.

The basisphenoid, as exposed ventrally, is longer than wide, reaching the level of the most constricted parts of pterygoid anteriorly. The posterolateral parts of the basisphenoid are covered by flanges of the pterygoids. The foramen posterius canalis carotici interni is visible along the posterior edge of the pterygoid at the fenestra postotica. The canalis carotici interni is covered with flanges of the pterygoid posteriorly and broadly exposed in ventral view anteriorly at the foramen basisphenoidale. This foramen is oval-shaped, bordered by the basisphenoid medially and the pterygoid laterally. The foramina for the branches of the internal carotid artery are not visible and their diameter is unclear due to poor preservation of the specimen. In general, morphology of basisphenoid in ZIN PH 7/15 is very similar to *H. hoburensis* and *J. sukhanovi*. There are two deep pits present on the ventral surface of the basisphenoid just anterior to the basisphenoid–basioccipital suture.

The morphology of the sella turcica and dorsum sellae is similar to *Ordosemys* in that the sellae turcica is somewhat reduced in size and the retractor bulbae pits extend dorsally to meet above the sellae turcica. The foramina anterior canalis carotici interni are located well apart. In *H. hoburensis* the sellae turcica is not reduced and has broad contact with the dorsum sellae (Egorova, 2004b; Danilov, pers. obs.)

Lower jaw – The lower jaw (Fig. 5A-C) is missing the posterior two thirds of its right ramus. The dentary bears a moderately wide triturating surface. A symphyseal hook is weakly developed. In lateral view, the dentary has no indentations. The coronoid process is relatively low and positioned well posterior to the middle of the jaw. The lateral surface of the coronoid process is excavated for adductor muscle insertion. The fossa meckelii is short. In medial view, the sutures between the coronoid, prearticular and angular are not clear. The foramen intermandibularis caudalis is located at the angular–prearticular suture. It is not clear whether the splenial was present.

Hyoid apparatus – Most of the hyoid apparatus was removed from the skull and destroyed during preparation of the specimen. It was represented by corpus hyoidei and branchial horns (cornu branchiale 1 and 2) (Fig. 5D). Distal parts of the cornu branchiale 1 are visible just posterior to the squamosals on both sides of the skull (Fig. 4B-D, F).

Shell – The shell of ZIN PH 7/15 (Fig. 5E, F) is represented by left anterolateral part of the carapace and plastron.

The fragment of the carapace includes left part of the nuchal, lateral parts of the left costals 1-4, and left peripherals 1-7. Sutures between plates of the carapace are not completely clear. For instance, the borders of the nuchal with the peripheral 1 and costal 1 can not be traced. The anterior edge of the carapace bears a small nuchal emargination. The peripherals are clearly upturned, forming a gutter near the free edge.

Scute sulci of the carapace are deep and easily visible. The cervical scute appears to be divided into three parts. This condition is not known in any ‘macrobaenid/sinemydid’ turtles, but is present in some Eucryptodira Gaffney 1975 (sensu Gaffney, 1984), i.e. the Plesiochelyidae Baur, 1888. This character may represent an atavistic aberration. The composite cervical corresponds to the wide cervical of most other ‘macrobaenids’. Vertebral 1 is widened anteriorly, contacting the second marginal. The lateral border of the vertebral 1 is s-curved. The marginals overlap lateral 1/2 to 2/3 of the corresponding peripherals.

The fragment of the plastron includes both epiplastra, entoplastron, anterior part of the right and anterolateral part of the left hyoplastra, and the anterolateral fragment of the left hyoplastron. The epiplastra are slender elements that meet in the midline, forming the rounded anterior end of the plastron. The entoplastron is somewhat deformed. Originally it appears to be a narrow diamond-shaped element that sutured to the anteromedial portions of the hyoplastra via

coarse dentations. The anterior buttress of the hyoplastron reaches the second peripheral as in other ‘macrobaenids.’ There appears to be no lateral fontanelles between hyo- and hypoplastron as reported earlier by Skutchas (2001) based on materials from Mogoito locality.

Scute sulci on the plastron are less deep than those of the carapace. The gular-humeral sulcus is clearly visible on both epiplastra. Although it is unclear whether it crosses the anterior tip of the entoplastron. The humeral-pectoral sulcus is visible below the entoplastron. The pectoral scute lies entirely on the hyoplastron. There are probably four inframarginals, although the sulcus between the inframarginals 2 and 3 is not visible due to poor preservation.

Non-shell postcrania – There is a fragment of the neck, containing the three cervical vertebrae, probably the second, third and fourth. Unfortunately, the preservation of this fragment is poor and no important characters can be observed.

The shoulder girdle of ZIN PH 7/15 (Fig. 5G) is represented by the left scapulocoracoid missing most part of the coracoid and distal part of the acromial process of the scapula. The scapular and acromial processes of the scapula form an angle of about 100°. As in *Ordosemys* and *Dracochelys bicuspis* a distinct glenoid neck is present on the scapula at the base of the glenoid.

The left humerus (Fig. 5H, I), the only preserved forelimb element, is poorly preserved. It does not have a sharp ridge that extends along the shaft of the humerus from the base of the lateral process as in *Ordosemys*.

DISCUSSION

Specimen ZIN PH 7/15 is similar in morphology to *Kirgizemys dmitrievi* and is referred to this species, although it differs from the holotype (ZIN PHT B59-1, anterolateral fragment of carapace) in shallower scute sulci, thinner bone,

and an s-curved lateral border of the vertebral 1 scute (straight in the holotype). A new diagnosis of *K. dmitrievi* is given in the Systematic Paleontology section (below).

The skull of ZIN PH 7/15 is most similar to *H. hoburensis* (Sukhanov, 2000) in the degree of the development of the upper temporal emarginations, the assumed presence of nasals, the prefrontals meeting each other at the midline, a very narrow jugal, the pterygoids overlapping the posterolateral parts of basisphenoid and other characters (see Description). Differences in skull morphology between ZIN PH 7/15 and *H. hoburensis* include the shape of triturating surface (widened posteriorly in ZIN PH 7/15), proportions of the lower jaw (more robust in ZIN PH 7/15), the morphology of the sellae turcica (reduced in size in the ZIN PH 7/15), and pattern of skull scalation. These differences seem to be of little value for higher-level taxonomy. For instance, it is well known, that morphology of jaws and head proportions may be very variable within a species of living turtles such as *Graptemys* Agassiz, 1857 (Dobie, 1981; Lindeman, 2000). Given the small differences between ZIN PH 7/15 and those described for *Hangaiemys* we question the utility of recognizing two separate genera for these fossils.

According to Nesson and Khosatzky (1978), *Kirgizemys* differs from *Hangaiemys* by the following shell characters: better developed medial ridge of the carapace, the presence of a distinct lip (and corresponding gutter) along the free edge of the bridge peripherals, a triangular cross-section of the free rib of the costal 1, the presence of costoperipheral fontanelles in the carapace and lateral fontanelles in the plastron. Sukhanov (2000) added to this list folded sculpture of the shell and wider cervical, but excluded the difference in the cross-section of bridge peripherals and did not mention shape of the rib. An examination of the type material of *K. exaratus* (collection ZIN PHT F-67) and *H. hoburensis* (collection PIN 3334) reveal no obvious differences between these taxa in the cross-section

of the free rib of the costal 1 and shape of the cervical scute. At the same time, different sculpture of the carapace, including presence/absence of the medial ridge, and presence/absence of fontanelles, is likely an ontogenetically controlled character as it is in extant turtles (Skutchas, 2001) and in any case may only be valuable for specific identification.

In recent year, diversity of 'macrobaenid/sinemidid' turtles and knowledge about their morphology have increased considerably (Brinkman and Peng, 1993a, b; Brinkman and Wu, 1999; Sukhanov, 2000; Brinkman, 2001; Parham and Hutchison, 2003; Tong et al., 2004; Matzke et al., 2004). This changes our idea about what characters are best-used to define groups of species (Tables 1 and 2). According to criteria used for other 'macrobaenid/sinemidid' turtles, the differences between *Kirgizemys* and *Hangaiemys* reflect mere species-level differences, and that the most useful taxonomy would recognize only one, more inclusive, genus. The generic name *Kirgizemys* Nesson and Khosatzky, 1973 has priority to *Hangaiemys* Sukhanov and Narmandakh, 1974 and so *Kirgizemys* is a subjective senior synonym. A new diagnosis of *Kirgizemys* is given in the Systematic Paleontology section (below). After this revision we can recognize *Kirgizemys* Nesson and Khosatzky 1973 as the first widely distributed basal eucryptodire lineage in the Early Cretaceous of Asia (Fig. 6). The relationships of *Kirgizemys* with other 'macrobaenids', as well as structure within *Kirgizemys* will be the subject of a separate study.

SYSTEMATIC PALEONTOLOGY

Testudines Batsch, 1788

Pancryptodira Joyce, Parham and Gauthier, 2004
Eucryptodira Gaffney, 1975 sensu Gaffney (1984)
Grade 'Macrobaenidae' Sukhanov, 1964 sensu Parham and Hutchison (2003)

Genus *Kirgizemys* Nesson and Khosatzky, 1973 (incl. *Hangaiemys* Sukhanov and Narmandakh, 1974)

Type species – *Kirgizemys exaratus* Nesson and Khosatzky, 1973.

Included species – Type species, *K. dmitrievi* Nesson and Khosatzky, 1981, *K. hoburensis* (Sukhanov and Narmandakh, 1974), comb. nov., *K. kansuensis* (Bohlin, 1953) and *K. leptis* (Sukhanov and Narmandakh, 2006) comb. nov.

Diagnosis – A ‘macrobaenid’ with the following characters: medium-sized (25 – 35 cm in the shell length) turtles; skull with a moderately developed upper temporal emargination, reaching anterior end of the otic capsule; nasals present; prefrontals contacting at the midline; jugal is a narrow bar; triturating surface narrow to moderately wide; foramen palatinum posterius moderate

in size; foramen basisphenoidale present; postero-lateral parts of the basisphenoid covered with medial phlanges of pterygoid; pterygoid-basioccipital contact present; canalis caroticus internus distant from the basisphenoid/pterygoid suture and floored by pterygoid posteriorly; sellae turcica reduced or not; shell oval-shaped with small nuchal emargination; nuchal restricted to the vertebral 1 scute; preneural absent; nine (rarely eight) neurals; plastron without medial fontanelles and plastral lobes not strongly narrowed; cervical scute wide; vertebral scutes 2-3 as long as or longer than wide; formula of cervical vertebrae - 1(2(3(4)5)6)7)8).

Comparison – For comparison with other ‘macrobaenid/sinemydid’ turtles see Tables 1, 2.



Fig. 6. Map showing the geographic distribution of the widespread Early Cretaceous basal eucryptodire *Kirgizemys*: 1, *K. exaratus*, Kylodzhun locality, south-eastern Fergana Depression, Kyrgyzstan, Alamyshik Formation, lower-middle Albian (Nesson and Khosatzky, 1978); 2, *K. dmitrievi*, see text and Fig. 1 for locality data; 3, *Kirgizemys* sp., Krasnyi Yar locality, left bank of Khilok River, Buryatia, Russia, Khilok Formation, Aptian (Nesson, 1997; Gordienko et al., 1999); 4, *K. hoburensis*, Andai Khudag (=Ondai Sair) and Buylyastyn Khudag localities, Mongolia, Aptian – Albian (Shuvalov and Chkhikvadze, 1979); 5, *K. hoburensis*, Höövör locality, Mongolia, Döshuul Formation, Aptian – Albian (Sukhanov and Narmandakh, 1974); 6, *K. leptis*, Hüren Dukh locality, Mongolia, upper part of Khulsangol Formation, Albian (Sukhanov, 2000); 7, *K. hoburensis*, Döshuul 1, 2, Ongon Ulaan Uul and Endregiin Nuru localities, Mongolia, Döshuul Formation, Aptian-Albian (Shuvalov and Chkhikvadze, 1979); 8, *K. kansuensis*, Jaiyuguan (=Chia-yü-kuan) locality, Gansu, China, Xinminbao Group, Chijinbao Formation, ?Albian (Bohlin, 1953; Dong, 1995); 9, *Kirgizemys* sp., Gyeongcheonri area, near Taegu, South Korea, Geoncheonri Formation, Aptian – Albian (Hutchison pers. com. IGD 2005).

TABLE 1. Comparison of selected 'macrobaenid/sinemydid' turtles in skull characters. The information about characters are taken from the following papers: *Anatolemys* (Nessov and Khosatzky, 1979), *Dracocheilus* (Gaffney and Ye, 1992), *Judithemys* (Parham and Hutchison, 2003), *Kirgizemys* (Sukhanov, 2000; Egorova, 2004b; this paper), *Macrobaena* (Tatarinov, 1959; Sukhanov and Narmandakh, 1976; Egorova, 2004b), *Ordosemys* (Brinkman and Peng, 1993a; Brinkman and Wu, 1999; Tong et al., 2004), *Sinemys* (Brinkman and Peng, 1993b), *Wuguia* (Matzke et al., 2004; Matzke and Maisch, 2004).

Characters	<i>Dracocheilus</i>	<i>Judithemys</i>	<i>Kirgizemys</i> (incl. <i>Hangaiemys</i>)	<i>Macrobaena</i>	<i>Ordosemys</i>	<i>Sinemys</i>
Nasals	Indet	Indet	Present	Absent	Present	Present
Prefrontals meet on midline	Yes	Yes	Yes	Yes	No	No
Extent of upper temporal emargination	Moderate	Less than <i>Sinemys</i> and more than <i>Kirgizemys</i>	Moderate	Small	Smaller than <i>Kirgizemys</i>	Large
Parietal-squamosal contact	Absent	Present	Present	Present	Present	Absent
Jugal bar	Wide	Moderate	Narrow	Moderate	Moderate	Moderate
Maxillary triturating surface	Narrow	Indet	Narrow to moderate	Wide	Wide	Wide
Paired cusps on premaxilla/maxilla suture	Yes	No	No	No	No	No
Foramen palatinum posterius	Large	Moderate	Moderate	Small	Moderate	Large
Otic capsule relatively small	Yes	No	No	No	No	No
Processus pterygoideus externus very large	Yes	No	No	No	No	No
Foramen basisphenoidale	Absent	Present	Present	Present	Present	Present
Basisphenoid pits	Absent	Present	Present	Absent	Present	Present
Medial processes of pterygoids cover posterolateral parts of basisphenoid	No	Yes	Yes	Indet	No	No
Position of canalis caroticus internus in relation to pterygoid-basisphenoid suture	Along the suture	Distant from the suture	Distant from the suture	Distant from the suture	Along the suture	Along the suture
Foramen posterior canalis carotici interni	Opens on the ventral surface of the skull	Opens in fenestra postotica	Opens in fenestra postotica	Opens in fenestra postotica	Opens on the ventral surface of the skull	Opens on the ventral surface of the skull
Sellae turcica reduced in size	Indet	No	Yes or no	Yes	Yes	Indet

TABLE 2. Comparison of selected 'macrobaenid/sinemysid' taxa in shell characters. For references see Table 1.

Characters	<i>Anatolemys</i>	<i>Dracochelys</i>	<i>Judithemys</i>	<i>Kirgizemys</i> (incl. <i>Hangaiemys</i>)	<i>Macrobaena</i>	<i>Ordosemys</i>	<i>Sinemys</i>	<i>Wugata</i>
	-70	-30	-40	-35	-55	-25	-20	-15
Length of the shell (cm)								
Carapace	Longer than wide	Longer than wide	Longer than wide	Longer than wide	Longer than wide	As wide as long	Longer than wide or wider than long	Longer than wide
Nuchal emargination	Absent	Large	Small	Small	Small	Small	Small	Small or absent
Hypo-xiphiplastral fontanelle	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent
Lobes of the plastron	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Narrow	Narrow
Nuchal	Narrower than vertebral I	Indet	Wider than vertebral I	Narrower than vertebral I	Wider than vertebral I			
Preneural	Present or absent	Absent	Absent	Absent	Absent	Present	Absent	Absent
Number of neurals	8	9	8	9(8)	8	8	9	8
Peripheral I contacts costal I	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Gutter on peripherals	Present	Absent	Absent	Present	Present	Present	Absent	Yes
Cervical scute	Narrow	Indet	Wide	Wide	Narrow	Wide	Absent	Wide
Vertebrales 2-3	Longer than wide	Wider than long	Wider than long	As long as or longer than wide	Longer than wide	Wider than long	Longer than wide	Longer than wide

Distribution – Early Cretaceous (Barremian – Albian) of Asia (Fig. 6). Presence of *Kirgizemys* sp. in several Early and Late Cretaceous localities of Uzbekistan (Nessov, 1997) is based on incomplete remains and needs corroboration.

***Kirgizemys dmitrievi* Nessov and Khosatzky, 1981**

Holotype – ZIN PHT B59-1; fragment of the left part of carapace including peripherals 1-2 and portion of costal 1; Mogoito locality, Buryatia, Russia (Figs 1, 6); Lower Cretaceous (Barremian – Aptian), Murtoi Formation (Nessov and Khosatzky, 1981, Pl. IV, fig. 1).

Previously referred material – Isolated plates of the shell from the type locality (collection ZIN PH B59): peripherals 1, 3, hypo- and xiphiplastron (Nessov and Khosatzky, 1981, Pl. IV, figs. 2, 5, 6 and 10). Hyoplastron (ZIN PH 2/15) from the type locality (Skutchas, 2001).

Newly referred material – ZIN PH 7/15 (Figs 2-5) is represented by parts of skeleton of one individual including incomplete skull with lower jaw and parts of hyoid apparatus, anterolateral fragment of the shell, several articulated cervical vertebrae, left scapulacoracoid and humerus (see Description); Gusinoozersk 1 locality, near Gusinoozersk city on the north coast of Gusinoye Lake in Buryatia, Russia (Fig. 1); Lower Cretaceous (Barremian – Aptian), Murtoi Formation.

Diagnosis – Triturating surfaces slightly wider posteriorly than anteriorly; sella turcica reduced in size; lower jaw robust; no fontanelles in the carapace and plastron of adults; anterior and bridge peripherals with a gutter; cervical scute divided into two or three parts (may be aberration); smooth shell surface.

Comparison – *K. dmitrievi* differs from other species of the genus in having divided cervical scute and from *K. exaratus* in absence of fontanelles in adults and a smooth shell surface, from *K. hoburensis* in having a gutter on bridge peripherals, wider triturating surfaces, reduced size of sel-

lae turcica and more robust lower jaw. Differences from *K. kansuensis* and *K. leptis* are not clear.

Distribution – Lower Cretaceous (Barremian – Aptian), Murtoi Formation; Buryatia, Russia.

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