UDC 567.9:551.735.3(282.247.415) Paleontological Journal, **29**(3), 1995

NEW SPECIES OF *Melosaurus* (AMPHIBIA, LABYRINTHODONTIA) FROM THE KAZANIAN OF THE KAMA RIVER DRAINAGE AREA

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Abstract: The genus *Melosaurus* is revised, and two new species are described: *M. compilatus* and *M. platyrhinus*. Study of some morphological features of various representatives of the family Melosauridae enables it to be divided into two subfamilies, the Melosaurinae and Trypho-suchinae, which characterize different horizons of the Permian deposits on the Russian craton.

Key words: Amphibia; Melosauridae; new taxa; Upper Permian; Kazanian; Russia; Kama River.

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Fossils of land vertebrates are very unevenly distributed in the Permian continental deposits of the East European platform. They are numerous in the Upper Kazanian to Tatarian rocks, but only a few solitary finds are known from the other deposits here. This is why Early Kazanian and older localities arouse special interest. The Golyusherma is one such locality: it has been mentioned very often in the literature, in discussions of the stratigraphy of the Permian deposits and the distribution of tetrapods in them. Yet the composition of the terrestrial vertebrate fauna from Golyusherma has been little known until recently.

The Golyusherma locality is in the Pervyye Prudki gully, a left outlet of Takhtashur (Shakhterskiy ravine) near Blagodat' settlement (in the Alnash district of Udmurtiya, northeastern part of European Russia). The creek running along the floor of the Takhtashur ravine is a left tributary of the Golyusherminka River, which in turn empties into the Izh River near the latter's mouth. This locality was found in the late 1920s [11], but has been very little excavated since

Translated from: Novyye vidy *Melosaurus* (Amphibia, Labyrinthodontia) iz kazanskikh otlozheniy Prikam'ya. Paleont. zhur., No. 3, pp. 86-97, 1995.

ISSN0031-0301/95/0003-0107
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then. The Urals Team of the Geological Faculty of Moscow University, headed by D. N. Esin, visited the locality in August 1989. The next year I made additional investigations of this locality.

The lower part of the Permian now exposed at the surface is represented by a thick sequence (several tens of meters) of red sandy-clayey rocks that are usually assigned to the Ufimian [12]. The overlying Kazanian deposits begin with a 10-meter band composed chiefly of red and grey sandstones with land vertebrates. This band is in turn overlain by carbonaceous shales (1 m), marls, sandstones and limestones with a marine fauna (3 m) and by gray clays (10 m). The section is capped by red sandy-clayey deposits with a visible thickness of 3 m [2].

The land vertebrates are confined to short (4-5 m), thin (up to 15 m) lenses of gray sandstones with marly grave. These lenses lie at two levels in the bone-containing band: at its base and at its top, directly beneath a coal seam 8-9 m above the preceding level). Besides the tetrapods, numerous scales have been found here: *Acentrophorus* sp., *A. varians* (Kirkby), *Acrolepis rhombifera* Eichwald, *A.* cf. *rhombifera* Eichwald, *A. sedgwicki* Agassiz, *Acrolepis* sp., *Acropholis kamensis* Esin, *A. stensioei* Aldinger, *Amblypterina* sp., *Boreolepis* sp., *Elonichthys contortus* Esin, *Eurysomus macrurus* (Agassiz), *Koinichthys ivachnenkoi* Esin, *Palaeoniscum kasanense* Geinitz et Vetter, *P.* cf. *freiselebeni* Blainville, *Palaeoniscum* sp., *Platysomus* sp., *Wardichthys inobilis* Esin and *Watsonichthys* sp. (identifications by D. N. Esin, Moscow Univ.); shark teeth of the suborder Hybodontoidea (preliminary identification by O. A. Lebedev, Paleontological Institute, RAS (PIN)); shells of the bivalved mollusk *Palaeomutela* sp. (identification by V. V. Silant'yev, Kazan University) and the plants *Cordaicarpus* sp., *Cordaites* sp., *Paracalamites* sp., *Pecopteris* sp., *Phylladoderma* (?) sp., *Sylvella* sp. (identified by A. V. Goman'kova of GIN, RAS); *Compsopteris* sp. (aff. *adzvenis* Zal.), *Cordaites* vel *Rufloria* sp., *Cordaicarpus* sp., *Cordaicarpus* cf. *chalmerjanus* Dombr., *Lepidophyta* indet. (type of preservation of *Aspidiaria), Nucicarpus* sp., "*Odontopteris*" *rossica* Zal., *Paracalamites* aff. *striatus* (Schmalhausen), *Pecopteris* sp., cf. *Prynadaeopteris* (?) *minuta* Vlad. (identificationsby S. V. Naugol'nykh, Geol. Institute, RAS). The bone-bearing deposits are rapidly replaced westward by silty-clayey rocks with linguiids and insects. These beds are known in the literature as the *"Lingula* clays," and in this area characterize the lower part of the Baytugan beds of the Kazanian stage [12]. Thus, the stratigraphic position of the bone beds at the Golyushenna locality can be determined as the lower part of the Baytugan beds (Lower Kazanian substage). This has also been confirmed by spore-pollen analysis.[1]

The PIN collections from Golyusherma include a few fossils of terrestrial vertebrates gathered in previous years (Spec. Nos. 4276/2, 5, 7, 10, 11, 40, 49, 56 and 66). The collectors and the exact stratigraphic position of these specimens are unknown. All the material collected in 1989-1990 is from the lenses at the lower level. These are composed of sandstones with carbonate cement, allowing chemical extraction of the fossil bone. The land vertebrates are represented by isolated, scattered, variously rounded bones of amphibians and reptiles. The far greater part (~90%) belongs to *Melosaurus compilatus* sp. nov. Other fossils include the upper jawbone of the dinocephalian *Microsyodon orlovi* Ivachnenko (Spec. PIN No. 4276/13), two interclavicles of a leptorophid close to *Leptoropha talonophora* Chudinov (Spec. PIN No. 4276/27, 32), and a postparietal bone of *Platyoposaurus* sp. (Spec. PIN No. 4276/37).

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[1]The results of our spore-pollen analysis of the Lower Kazanian deposits will be considered in a separate publication that is in preparation by myself and my coauthor M. N. Shelekhova.

Table 1

Dimensions in mm (a) and Ratios (b) of Certain Skull Characteristics in Various Representatives of Family Melosauridae (for legend, see fig. 1)

a	*M. uralensis*	*M. compilatus* (4276/60)	*M. kamaensis* (No. 683/1)	*M. platyrhinus* (No. 161/1)	*K. vetusta* (No. 520/1)	*M. tarda* (No. 1758/2545)
a	231		445	220	282	285
b	196			189	244	239
c	134	157	253	126	163	154
d	62			61	81	84
e	36	39	85	29	47	38
f	98	118	168	96	116	123
g	30		64	28	38	41
h	32			33	44	44
i	55	62	128	60	67	69
j	115	140	234	112	116	126
k	26	35	79	46	50	52
m	23	29	50	27	27	27
n	29	31	86	27	42	45
o	127	151	300	133	167	173
p	32	34	43	31	32	33
q	23	28	39	26	28	28

b	*M. uralensis*	*M. capilatus* (4276/60)	*M. kamaensis* (No. 683/1)	*M. platyrhinus* (No. 161/1)	*K. vetusta* (No. 520/1)	*K. tarda* (No. 1758/254)
a/j	2,00		1,90	1,96	2,43	2,26
a/q	10,00		11,4	8,5	10,1	10,2
b/a	0,85			0,86	0,86	0,84
c/a	0,58		0,57	0,57	0,58	0,54
e/a	0,16		0,19	0,13	0,17	0,13
e/c	0,27	0,25	0,34	0,23	0,29	0,25
f/a	0,42		0,38	0,44	0,41	0,43
f/j	0,85	0,84	0,72	0,86	1,00	0,98
g/c	0,22		0,25	0,22	0,23	0,27
i/a	0,24		0,29	0,27	0,24	0,24
i/c	0,41	0,39	0,51	0,48	0,41	0,45
k/c	0,19	0,22	0,31	0,37	0,31	0,34
k/i	0,47	0,56	0,62	0,77	0,75	0,75
l/a	0,20		0,20	0,24	0,20	0,19
l/c	0,34	0,36	0,35	0,42	0,34	0,38
l/j	0,40	0,41	0,38	0,47	0,47	0,44
m/l	0,50	0,51	0,56	0,51	0,49	0,49

A closely similar form of *Melosaurus* is known from the Shikhovo-Chirki locality (Kirov region). It was previously described as *Melosaurus uralensis* [4, 6, 8]. But comparison with the holotype of *Melosaurus uralensis* Meyer (cast and photograph of holotype; Spec. No. # MB. Am. 1, Berlin Museum of Natural History) shows that despite its similar size, the Shikhovo-Chirki form differs in its wider snout and more widely separated orbits (Table 1). These features enable it to be regarded as the new species *Melosaurus platyrhinus* sp. nov. The Golyusherma form, on the other hand, is characterized by a somewhat narrower, more elongated snout. In this respect it resembles *Melosaurus uralensis* Meyer (i/c and k/c; table 1), but differs from the latter in its larger skull, the location of its nostrils closer to the lateral margins of the skull (k/i) and the round shape of its orbits. On the basis of the latter characteristics, the Golyusherma form is regarded as a representative of the new species *Melosaurus compilatus* sp. nov.

At present, the family Melosauridae includes 5 genera: *Melosaurus* Meyer, 1857; *Konzhukovia* Gubin, 1991; *Tryphosuchus* Konzhukova, 1955; *Koinia* Gubin, 1993 and *Uralosuchus* Gubin, 1994 [4, 5]. *Melosaurus* is closest to the genus *Koinia*. Some characteristic features of both these genera are: (1) a cochleariform widening of the anterior end of the skull, manifested to a greater or lesser degree; (2) location of the posterior margin of the choana forward of the anterior interpterygoid vacuity; (3) the anterior end of the lower jaw not curved upward, with a rectilinear (in plan) symphysial region; (4) the horizontal lamina on the medial side of the dentary bone close to the symphysis; (5) the massive circumarticular block of the lower jaw; (6) symphysial canine teeth very slightly exceeding the anterior teeth of the lower jaw in size; and (7) the coarse radially cellular and radially ridged sculpture on the angulare. These two genera can be combined into the subfamily Melosaurinae Huene, 1931 (type genus *Melosaurus* Meyer, 1857). *Konzhukovia, Tryphosuchus* and *Uralosuchus* can be combined into the subfamily Tryphosuchinae (type genus *Tryphosuchus* Konzhukova, 1955), which in contrast to the preceding subfamily is characterized by: (1) no widening of the anterior end of the skull; (2) location of the posterior margin of the choana behind the level of the anterior margin of the interpterygoid vacuity; (3) an upward-curved anterior end of the lower jaw with a Г-like bend (in plan) of the symphysial part; (4) a narrow dentary bone behind the symphysis, with no horizontal lamina; (5) a less massive circumarticular block of the lower jaw; (6) very large symphysial canine teeth in comparison to the anterior teeth on the lower jaw; (7) a finer sculpture of the cellular and radially cellular type on the angulare.

The Melosaurinae are part of the Golyusherma subassemblage of the Ocher faunal assemblage of Late Permian tetrapods [7] and characterize the Kazanian stage [3, 5, 10]. The Tryphosuchinae are part of the Ocher subassemblage and the Isheyevo assemblage [7], and have a wider stratigraphic range: uppermost Kazanian to Lower Tatarian [3, 4]. The exact position of the boundary between the deposits with these two faunal groups—that is, between the Ocher and Golyusherma subassemblages of the Ocher assemblage—in the Upper Permian section on the Russian craton cannot be determined at the present. However, the available data justify the conclusion that it lies in the upper part of the Upper Kazanian substage, closer to the upper boundary of the latter.

FAMILY MELOSAURIDAE HUENE, 1931

SUBFAMILY MELOSAURINAE HUENE, 1931

Genus ***Melosaurus*** Meyer, 1857

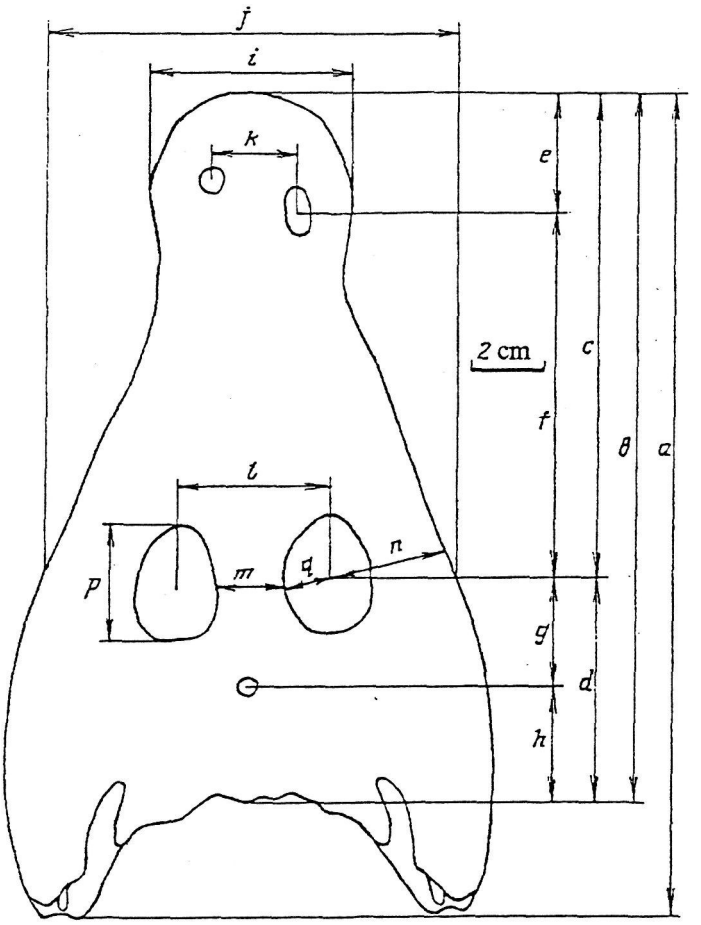

Fig. 1. Diagram of measurements of main characteristics of skull using *Melosaurus uralensis* Meyer (contours of skull reconstructed): *a* - total length of skull; *b* - skull length along axial line; c - distance between anterior margin of skull and centers of orbits; *d* - distance between centers of orbits and posterior margin of postparietal bone; *e* - distance between anterior margin of skull and centers of nostrils; *f* - distance between centers of nostrils and orbits; *g* - distance between center of parietal foramen and line connecting centers of orbits; *h* - distance between center of parietal foramen and posterior margin of postparietal bone; *i* - width of snout at level of centers of nostrils;; - width of skull at level of middle of orbits; *k* - distance between centers of nostrils; *l* - distance between centers of orbits; *m* - minimal distance between inner margins of orbits; *n* - minimal width of jugal bone at level of orbits; *o* - transverse line of skull roof at level of middle of orbits; *p* - maximal length of orbit; *q* - maximal width of orbit.

Melosaurus: Meyer, 1857, p. 540; Gartman-Weinberg, 1939, p. 9; Konzhukova, 1955, p. 8; Konzhukova, 1964, p. 73; Gubin, 1991, p. 22.

Type species. *Melosaurus uralensis* Meyer, 1857; Russia, Bashkiria, vicinity of Sterlitamak; Upper Permian, Kazanian.

Diagnosis. Skull with distinct jugal curve and constriction behind nostrils. Coefficient of elongation of skull (a/j, table 1) - 1.9-2.0. Angle between branches of lower jaw - 27-33°. Anterior palatal fossae paired, with perpendicular anterior and lateral walls. Alveolus of last tooth of premaxillary bone considerably smaller than two preceding alveoli. Up to six teeth in parachoanal tooth row of vomer. Palatal surface of vomer covered with numerous shagreened teeth. Occipital margin of quadrate bone with distinct tuberculum hyoideum. Body of parasphenoid short, square and slightly concave. Retroarticular process of lower jaw low and indistinct.

Specific composition. Four species: *M. uralensis* Meyer, 1857; *M. kamaensis* Gubin, 1991; *M. platyrhinus* sp. nov.; and *M. compilatus* sp. nov.

Comparison. Differs from genus *Koinia* in less prominent low retroarticular process and smaller angle between branches of lower jaw [5].

Distribution. Upper Permian, Kazanian; eastern part of European Russia.

Melosaurus platyrhinus Golubev, sp. nov.

Melosaurus uralensis (non Meyer): Konzhukova, 1955, p. 9, figs. 1-3; Gubin, 1991, p. 22, pl. III, fig. 2.

Specific name. Greek *platys* (wide) and Greek *rhinos* (nose).

Holotype. PIN No. 161/1, skull; Russia, Kirov region, Slobodskoy district, abandoned underground quarries south of Chirki settlement, Shikhovo-Chirki locality; Upper Permian, Kazanian, upper substage.

Description (fig. 2). Skull is 220 mm long and 136 mm wide at level of occiput. Angle between lines passing through centers of jaw condyles and end of snout in 27°. Table 1 gives comparisons with other species of genus in this and other characteristics (fig. 1).

Nostrils are elongated-oval, extended parallel to axis of skull. Their length is 1.8-1.9 times their width. Nostrils are widely separated (k/c = 0.37) and located close to anterior margin of snout (e/a = 0.13, e/c = 0.23). Orbits are round to oval, their longer axis directed at angle to medial line of skull. Lateral sides of otic notches are parallel and directed along axial line of skull. Dorsal surface of skull forward and laterally outward of orbits is covered with radially cellular and ridged sculpture, and behind and medially of them with cellular sculpture.

Of all grooves for organs of lateral line, only postorbital is well developed. Infraorbital, central and anterior parts of supraorbital and anterior part of jugal canals can be traced by chains of wider cells separated by fairly low septa.

Nasal bone is wide, its length behind nostrils three times its width. Contact with prefrontal bone is short. Width of jugal bone at level of orbits usually corresponds to width of latter.

Anterior palatal fossae paired, isometric, with almost vertical posterior walls. Their posteromedial parts are occupied by oval fenestrae praemaxillares. Cavity bordered by dorsal and

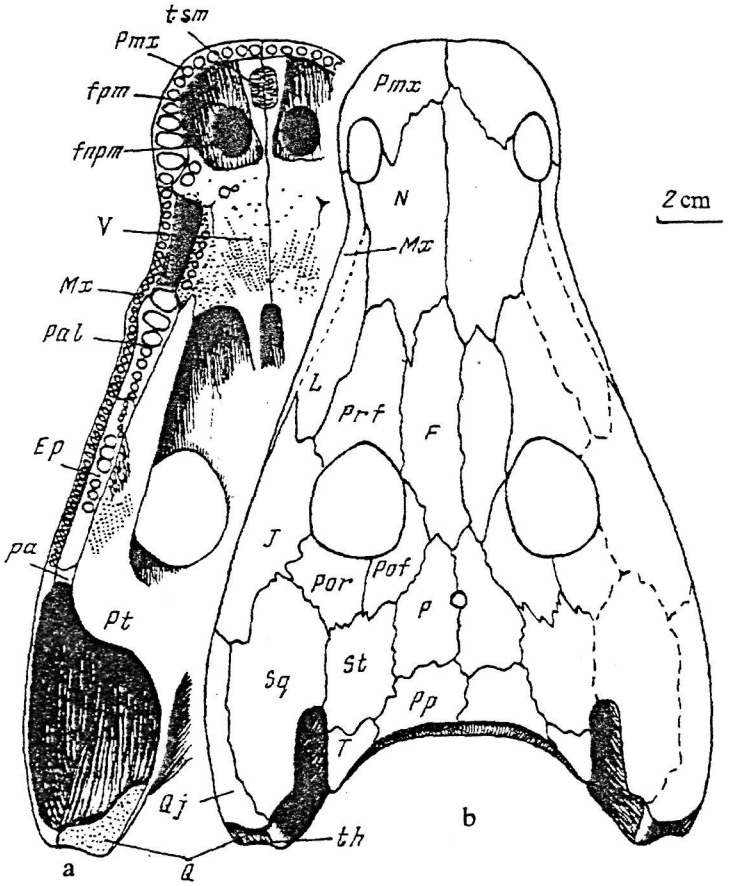

Fig. 2. *Melosaurus platyrhinus* sp. nov., skull, Holotype PIN No. 161/1: *a* - from below, *b* - from above. Legend: *EP* - *ectopterygoideum*, *F* - frontale, *fnpm* - fenestra praemaxillaris, *fpm* - fossa praemaxillaris, *J* - jugale, *L* - lacrimale, *Mx* - maxillare, *N* - nasale, *P* - parietale, *pa* - processus alaris jugalis, *Pal* - palatinum, *Pmx* - praemaxillare, *Pof* - postfrontale, *Por* - postorbitale, *Pp* - postparietale, *Prf* - praefrontale, *Pt* - pterygoideum, *Q* - quadratum, *QJ* - quadratojugale, *Sq* - squamosum, *St* - supratemporale, *T* - tabulare, *th* - tuberculum hyoideum, *tsm* - tuberculum subrostrale medium, *V* - vomer.

ventral laminae of premaxillary bone (cavum praemaxillare) reaches level of anterior margin of premaxillary fossae, as in *M. kamaensis* (Spec. PIN No. 683/3). Judging by sizes of alveoli, largest teeth on premaxillary bone are 2nd, 3rd and 4th teeth from contact with upper jawbone; last teeth are equal in size to 6th and 7th. This differentiates new species from *M. kamaensis,* in which largest teeth on premaxillary bone are 2nd and 3rd from end, and last tooth is somewhat smaller than 2 preceding ones but larger than all other pre-maxillary teeth.

Parachoanal tooth row of vomer has 6 teeth. No more than two interchoanal teeth are present. Palatal surface of vomer is covered with shagreen teeth scattered randomly or ranged in long straight rows at angle of 20° to axial line of skull. Teeth of palatal row become rapidly smaller rearward. Palatinum bears eight teeth which rapidly become smaller rearward; ectopterygoideum has 11 teeth, of which 6th, 7th and 8th from front are considerably larger than rest. Palatal branch of pterygoid reaches vomer. Its central surface (where accessible to study) is covered with rows of shagreen teeth, and along lateral margin at level of anterior half of ectopterygoid by sculpture of ridges and cells.

At level of postchoanal canine teeth, maxillare is somewhat narrower than elsewhere, and is somewhat convex outward. Along lateral margin of choana, inner surface of bone forms stepped fairly narrow horizontal lamina (lamina parachoanalis). Posterior part of latter is perforated by large aperture (foramen choanale maxillare), which probably served as outlet for branches of maxillary nerve and maxillary artery. From this foramen to ventral surface of lamina runs distinct groove (sulcus parachoanalis). This structure is typical only of genus *Melosaurus* and distinguishes it from other genera of its family.[2]

Comparison. Differs from *M. uralensis* in widely separated nostrils and orbits, wider nostrils, round orbits, wide snout, and straight, wider, forward-directed otic notches. Differs from *M. kamaensis* in having nostrils closer to anterior margin of skull, widely separated orbits, presence of maxillary foramina, isometric premaxillary fossae, and size distribution of premaxillary teeth.

Material. Holotype, and Spec. Nos. 161/2 - skull fragment; 161/3 - anterior end of lower jaw; 120, 121 - praemaxillaria; and 122 - maxillare; all from type locality.

Melosaurus compilatus Golubev, sp. nov.

Specific name. Latin *compilatus* (composed).

Holotype. PIN No. 4276/60, fragment of skull roof; Russia, Udmurtia, Alnashskiy district, Blagodat' settlement, Golyusherma locality; Upper Permian, Kazanian, lower substage, Baytugan beds.

Description (figs. 3, 4). Overall length of skull, as reconstructed for holotype from coefficients a/j, c/a, e/a, e/c, f/a, l/a and l/c, is within range of 270-285 mm, average 277 mm. Angle between lines passing through centers of jaw condyles and anterior tip of snout is 29°. Skull has relatively elongated snout (i/c = 0.39). Orbits are almost round, with their longer axis directed at angle to midline of skull. Chains of wider cells separated by lower septa.

Nasale is strongly elongated (its length to width ratio at level of posterior margin of nostrils is 4:1). Contact with prefrontal bone is extended. Praefrontale wedges out as long as comparatively narrow process between lacrimal and nasal bones. Width of jugal bone at level of orbits always exceeds width of latter.

Anterior palatal fossae are guttiform and occupy entire ventral surface of premaxillary bones, and are deepest in anterior part. These fossae level out gradually rearward, as in *M. kamaensis*, at level of posterior alveolus of canine tooth on vomer. Anterior palatal foramina are oval and elongated longitudinally. Cavum praemaxillare probably did not reach level of anterior margin of. premaxillary fossae. Teeth of premaxillary bone are distributed by size as in *M. platyrhinus*. Parachoanal tooth row of vomer has 5 or 6 teeth; interchoanal row has 2. Ventral surface of vomer is covered with shagreen teeth, which are most numerous in posteromedial part. Here they are randomly scattered (as over remainder of surface), or more rarely, form short rows at angle of 8-10° to longitudinal axis of vomer.

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[2]It is of interest to note that similar aperture, groove and horizontal parachoanal lamina on upper jawbone are present in *Intasuchus silvicola* Konzhukova (Spec. PIN No. 570/2).

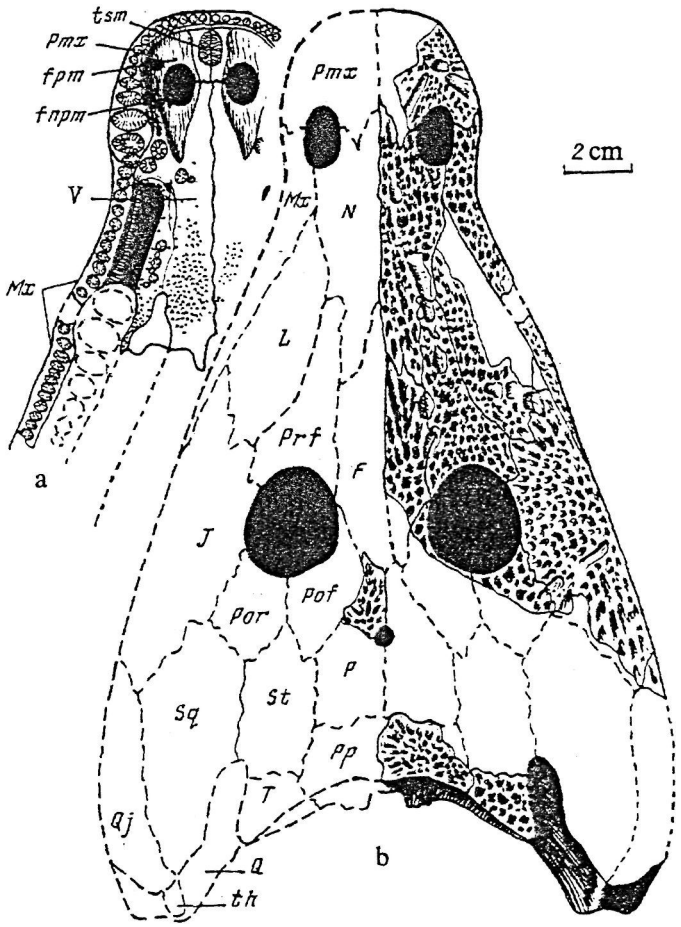

Fig. 3. *Melosaurus compilatus* sp. nov., skull, reconstructed from Spec. No. 4276/15, 19, 30, 38, 54, 57, 58, 60, 64, 71: *a* - from below, *b* - from above. For legend, see fig. 2.

Ventral surface of ectopterygoid has 2 large alveoli for canine teeth, behind which is row of 4 smaller alveoli. Forward of canine teeth are more small alveoli, but their number cannot be determined because anterior part of this bone is missing.

Central part of pterygoid bone, contacting on parasphenoid, is unusually massive (Spec. No. 4267/45), which is uncharacteristic of this family. It corresponds in its massiveness to central part of pterygoid of *Melosaurus kamaensis* (Spec. No. 683/1), whose skull is almost twice as large as that of *M. platyrhinus.* Anteromedial margin of bone is sharply bent at nearly right angle. Interpterygoid vacuity, therefore, has triangular form. Ventral surface of palatal branch of pterygoid is covered with numerous randomly scattered shagreen teeth to level of middle of parasphenoid.

Quatrum has long lamelliform branch that forms medial wall of adductor fossa. This indicates that ossification of the quadrate branch of palatoquadrate cartilage went much farther in this form than in *M. platyrhinus,* which does not have this plate. This feature, however, may reflect only individual or age variation.

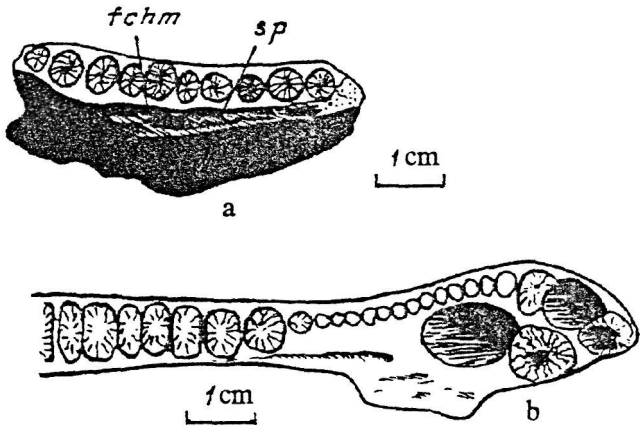

Fig. 4. *Melosaurus compilatus* sp. nov.: *a* - fragment of maxillare, from below; *b* - anterior fragment of left branch of lower jaw, from above, reconstructed from Spec. Nos. 4276/23, 24. Legend: *fchm* - foramen choanale maxillare, *sp* - sulcus parachoanalis.

Maxillare narrows somewhat at level of palatal canine teeth and is somewhat convex outward. Forward of posterior margin of choana, medial surface is perforated by large aperture (foramen choanale maxillare), from which, forward to horizontal lamina (lamina parachoanalis), extends wide groove (sulcus parachoanalis) for maxillary nerve and maxillary artery, which runs inside bone along continuous canal (fig. 4*a*). At level of anterior margin of choana, groove contains one more large aperture.

Lower-jaw symphysis is short. Anterior end of dentary bone widens somewhat, and its upper margin may form small cochleariform expansion, which is variously manifested in different specimens, and is considerably less prominent than in *M. kamaensis*, but more strongly than in *M. platyrhinus*. Teeth, judging by alveoli, were strongly differentiated by size. Largest were first more rarely 3 teeth. They are fully commensurate in size with symphysial canine teeth, one pair of which is located in each branch of lower jaw. Teeth diminish sharply in size rearward, but beginning with 18th tooth again become sharply larger, reaching size of front teeth. From this level, bases of teeth begin to occupy whole dorsal surface of bone. Behind symphysis, dorsal part of bone on lingual side forms horizontal lamina 18 mm long and 6 mm wide. Wide groove runs along its upper surface from front to back. Farther back it continues on body of dentary bone itself and runs along its medial margin, grading into outer coronoid groove that is known in many Paleozoic and Mesozoic amphibians and crossopterygian fishes [4]. Within coronoid bone, floor of inner coronoid groove is pierced by numerous large apertures, from which canals extend into interior of bone. These merge posteriorly into single canal. Meckelian cavity has structure typical of melosaurids. At level of 20th tooth from front, posteriorly single Meckelian cavity divides into medial and lateral canals, first of which was joined to that on opposite side at level of middle of symphysis, whereas second terminates in blind end below symphysial canine teeth. Other lower-jaw bones have structure typical of genus *Melosaurus* and other archegosaurid amphibians [4].

Comparison. Differs from *M. uralensis* in larger size, position of nostrils closer to lateral margins and round form of orbits. Differs from *M. kamaensis* in smaller size, narrower snout,

more forward position of nostrils, presence of premaxillary foramina, and character of size distribution of teeth on premaxillary bone. Differs from *M. platyrhinus* in larger size, narrow nasal bones, guttiform premaxillary fossae, longer and narrower vomer, and distribution of shagreen on vomer.

Material. Holotype, plus following specimens from type locality: Nos. 4276/1, 18, 51, 73 - angularia; 2, 5, 10, 26, 39, 40, 56 - claviculae; 61 - coronoideum; 8, 11, 12, 36, 41, 48 - costae; 23, 24, 29, 47, 55, 65, 70 - dentalia; 22 - ectopterygoideum; 33, 43, 50 - frontalia; 46 - ilium; 16 - interclavicula; 31, 66, 69 - jugalia; 25, 38, 57 - maxillaria; 6 - nasale; 63 - palatinum; 54,, 67 - parietalia; 34 - postorbitale; 19 - postparietale; 14, 21, 62 - postsplenialia; 4 - praearticulare; 17, 28, 53 - praefrontalia; 30, 71, 72 - praemaxillaria; 20, 45 - pterygoidea; 68 - quadratojugale; 15 - quadratum; 44, 59 - scapulocoracoidea; 35 - spleniale; 64 - tabulare; 9, 58 - vomeres.

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Most Kazanian tetrapod localities are confined to deposits that were accumulated in the immediate vicinity of the Kazanian Sea, which corresponds stratigraphically to the base of the Belebey Formation [3]. This is where all the melosaurs have been found. The distribution area of these animals is expanded by the finds from Sidorovy Gory, one of the few localities formed at a considerable distance (several tens of kilometers) from the sea shore. This paleogeographic position of the locality must obviously have affected the composition of its land vertebrate fauna.

This locality is located on the right bank of the Kama River at Sidorovy Gory settlement (Udmurtia, Votkinsk district). Red sandy-clayey deposits of Kazanian age (according to Ye. I. Ulanov) with numerous lenses of gritstones and conglomerates are exposed at the surface along the river bank and the slopes of gullies. Geologic surveys here have resulted in the finding in these lenses of bones of a new theromorph; these fossils were transmitted by Ye. I. Ulanov (Nizhegorod Geologic Survey Expedition) to P. K. Chudinov at PIN, RAS. In 1985 members of the zoology department at the University of Udmurtia found fossil bones here that are now in the Izhevsk Regional Museum. I visited this locality in 1992. Isolated scattered tetrapod bones were found in all the lenses, but the richest source turned out to be just one lens at the very base of a precipitous river bank, 45 m below the mouth of a deep ravine that cuts through the river bank immediately below the settlement. This lens is composed of a conglomerate of well-rounded red clay pebbles and gravel. The matrix is a yellow-gray medium-grained sand held together by a calcareous cement of the poikilitic type. The large (up to 30 cm) fragments of land vertebrate bones are evenly and randomly distributed through the rock, but the concentration of bones here is not very high. No other fossils have been found in the lens or its surrounding host deposits. Attempts to extract a spore-pollen spectrum from the conglomerates have not been successful.

Besides the poorly identifiable postcranial remains that make up the main part of the material, a circumarticular fragment of the left branch of the lower jaw of a labyrinthodont was found here (Spec. PIN No. 4312/2, fig. 5). The preserved part of its outer surface (the posterior part of the supraangular bone) is covered with a coarse sculpture of ridges. The ridges are spaced 5-9 mm apart and run subparallel to the posterior margin of the jaw. The sulcus articularis is distinct. The posterodorsal margin of the supraangular forms the high raised posterior margin of the articular socket. The retroarticular process is not prominent, and is triangular. The articular socket is fabiform (42 mm long with a maximal width of 16 mm) and gently concave. The angle between its longer axis and the lateral wall of the adductor fossa is 42°. The posterior margin of the socket has the form of a gently convex arc. On the lingual side

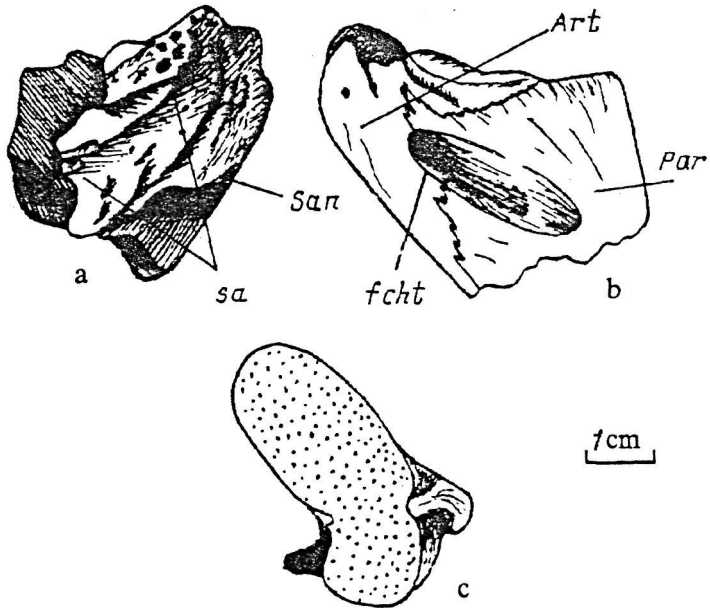

Fig. 5. *Melosaurus* sp., posterior fragment of left branch of lower jaw, Spec. No. 4312/2: *a* - outer side, *b* - inner side, *c* - from above; Udmurtia, Sido-rovy Gory settlement. Legend: *Art* - articulare, *fcht* - foramen chordae tympani, *Par* - praearticulare, *sa* - sulcus articularis, *San* - supraangulare.

of the jaw, below the articular socket, is a distinct, relatively deep depression of elongated oval shape. Its length is 26 mm, its maximal width 7 mm, and its longer axis forms an angle of 30° with the posterior margin of the jaw. The anteroventral end of this depression contains a small aperture, from which a canal extends into the interior of the prearticular bone. The posterior part of the depression, lying within the articulare, contains a large elongated foramen chordae tympani. From this foramen into the bone extends a wide canal that first runs laterally but then bends sharply below the articular socket and runs forward. This canal opens out through a large aperture in the posterior wall of the adductor fossa, at the contact of the articulare and supraangulare.

The coarse cellular, in places cellular-ridged, sculpture and the well-developed groove of the canal of the seismosensory system on the angular and supraangular bones are features characterizing the Melosauridae family, which are extensively distributed in the Kazanian to Lower Tatarian deposits on the Russian craton. The presence of these features in the form described here enables it to be assigned with confidence to this family. In *Platyoposaurus*, a representative of the Archegosauridae, from the same deposits on the East European platform, the sculpture is of the fine-cellular type, and the sulcus articularis is not manifested. The massive articular block, elongated fabiform articular socket and arcuate posterior margin are features characteristic of the Kazanian Melosaurinae. In the later (Early Tatarian) Tryphosuchinae the periarticular region is considerably less massive and the articular socket is subrhombic. In its indistinct retroarticular process, the form above resembles *Melosaurus* and differs from *Koinia* [5]. In view of all the above, the lower jaw fragment here can be identified as *Melosaurus* sp. Since the genus *Melosaurus* is characteristic exclusively of the Kazanian stage [3], this identification is not contrary to the current Kazanian dating of the bone-bearing beds at the Sidorovy Gory

locality. At present the land vertebrate fauna of this locality can be included in the Golyusherma subassemblage of the Ocher assemblage [7].

The research for this article was supported financially by the George Soros Fund.

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