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Morphological differences (distinctions) of *Necromites nestoris* from the family *Semantoridae* (Mammalia, Pinnipedia)

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(Par. 1.) The fossil family Semantoridae was placed in the order Pinnipedia (1931) by Yu. A. Orlov (4) on the basis of a study of a mammal form transitional from land to water discovered in Neogene deposits of Western Siberia. Semantor macrurus Orl. comes from the celebrated Hipparion fauna from a locality on the right bank of the river Irtish near the town of Pablodar. The remains of Semantor, representing the rear half of the skeleton, posesses not only features typical of primitive seals, but also a number of anatomical features approaching those of Lutrinae. As a result of this, remains of S. macrurus are of great interest. As the result of a detailed comparative-anatomical study of the remains of the skeleton of Semantor, Yu. A. Orlov came to the following conclusions.

(Par. 2.) The combination of anatomical characters of the pelvis and hind limbs of Semantor are so typical of seals, that to refer it to any other order of mammals is not possible. The whole set of morphological features of the skeleton of Semantor approaches most closely to the family Phocidae, which suggests its close adaptation to a water medium. Apart from this Semantor shows primitive features in comparison with other (fossil and contemporary) examples of the order of Pinnipedia.

(p. 9, Par. 3.) Semantor is a representative of a lateral branch of the order Pinnipedia and cannot be considered as an ancestral form nor as one of its well-known families.

Firstly, it is comparatively young in geological age (Upper Miocene), at a time when fossil seals have been found which were further adapted to water life. Secondly, as the author indicates, certain singular features of anatomical structure of the hind limbs, for example, full fusion of the cuneiformia I and II (not met with at all in any seals), show a very singular specialization distinct from other seals. Yu A. Orlov considers Semantor a coastal predator of Neogene rivers, as agile on dry land as in water. But everything, in the opinion of the author suggests that its fundamental element was water.

(p. 10, Par. 1.) The Austrian palaeozoologist E. Thenius (6) who published in 1949 questioned the systematic position of S. macrurus. He considered Semantor to be a representative of a highly specialized genus of the sub-family of otters. He arrived at this conclusion by calculating the relative percentages otterlike and seal-like characters of Semantor. By this calculation he concluded that Semantor has 55% otterlike characters, 6% seal-like characters, and 38.5% intermediate characters. All these calculations were made by said author not on the basis of first hand examination, but by using data published by Yu. A. Orlov.

In 1955 A. A. Kirpichnikov (3), described a humerus of Semantor found in 1934 by V. I. Gromov on the right bank of the river Irtish. This bone was derived from the same stratum in

which Yu A. Orlov discovered the hind half of the skeleton of S. macrurus. A. A. Kirpichnikov draws the conclusion that the humerus described by him, and the partial skeleton found by Yu. A. Orlov, belong to one and the same example. This humerus is somewhat larger than the humerus of the contemporary Caspian seal and is rather similar to that of the ringed seal. Noting that the described humerus reminded him in general characters of the humerus of the present earless seals (Phocidae), the author stressed that in details of anatomical structure it had a number of important differences from the humerus of the latter. The humerus of Semantor is somewhat nearer, says the author, to the corresponding bone of a fossil Mid-Sarmatian seal, found in the neighbourhood of the town of Kishiner. The author notes significant and sharp differences of the humerus of Semantor from that of the river otter.

(p. 10, Par. 3) As the result of the discovery of the humerus of Semantor A. A. Kirpichnikov agreed with some of the conclusions of the first describer of Semantor, Yu. A. Orlov. In particular A. A. Kirpichnikov agreed with the statement that Semantor was doubtless close to seals (Phocidae), whereas concerning the genetic closeness of Semantor to otters he held a different opinion from Yu. A. Orlov. In this context A. A. Kirpichnikov writes: "A certain superficial resemblance to otters in the structure of different elements

of the axial skeleton of Semantor cannot be considered as a reliable index of their direct phylogenetic closeness". The author writes on the likelihood of links between Semantor and seals, inhabiting the vast mid-Sarmatic basin. In the work of A. A. Kirpichnikov one discovers a reflection of the paper of Thenius on Semantor, but the author did not agree with Thenius concerning the systematic position of Semantor.

(Par. 4.) K. K. Chapskii in his work "Present status and problems in the systematics of seals" examines the systematic position of S. macrurus. Concerning the immediate ancestor of seals among land animals the author writes that an attempt to throw a bridge between land carnivores and seals with the aid of such an amphibious form as Semantor cannot have success. The author considers Semantor to represent a mustelid resembling more a seal than the present otters and sea otter. Clearly, the opinion of K. K. Chapskii in this question coincides with that of E. Thenius. K. K. Chapskii considers a mistake its inclusion into the classificatory scheme of Pinnipedia by Simpson and expresses the thought that the fossil family Semantoridae probably must be excluded from the order of seals. In the cited work the author writes also about the humerus of Semantor, described by A. A. Kirpichnikov, that it "shows very clear criteria of seals." He considers that its assignment to Semantor can be disputed.

(p. 11.) As apparent from what has been said, the systematic position of Semantor for the present is not finally decided and on this question there exist in the literature certain opposed opinions. But independently of what place S. macrurus enters in future systematic rank, in detail, whether it remains in the order Pinnipedia or not, it remains necessary to carry out a comparison of the remains of the skeleton of Necromites nestoris Bog., with Semantor. Such a comparison is necessary if only because, in present classifications of known fossil mammals, the family Semantoridae is included in the order of seals. Besides this, V. V. Bogachev (2) in his preliminary note on N. nestoris attributed it to the family Semantoridae.

The present paper is devoted to exposing the morphological differences of the remains of a skeleton of the Necromite, a very interesting aquatic mammal, found in limestones of Apsherian age in the vicinity of Baku.

To compare the remains of a Necromite with the remains of Semantor is rather difficult, in view of the fact that Semantor is represented in the main by the hind part of the skeleton, and the femurs of Necromites, relating to the back half of the skeleton, are very fragmentary. The sacrum of the Necromite, represented by the imprint of the ventral surface, differs from that of Semantor. First of all there is a

difference in general morphological structure of the indicated bones. In spite of the fact that the sacrum of Necromites, like the pelvis of Semantor, consists of three fused vertebrae, the size relations of these vertebrae are very different.

The first sacral vertebrae of the Necromites is larger than all the others. The second and third sacral vertebrae of Necromites are smaller in size, which gives the sacrum a triangular form, characteristic of seals.

The Sacrum of Semantor has a different form from that of Necromites. The first sacral vertebra of Semantor is not sharply distinct in its size from the rest. The strongly developed transverse processes of the sacral vertebrae of the sacrum of Semantor (judging by the reconstruction of Yu. A. Orlov) give it a broad appearance, which makes it like that of an otter. In Necromites such strong growth of the transverse processes is not seen, they are very moderately developed in the third and incompletely in the second sacral vertebra. This character, peculiar to seals, depends on the form and means of attachment of the pelvic bones.

(Par. 7.) The sacrum of Necromites is well distinguished from that of Semantor in the form and location of the facies auricularis. While in Semantor these surfaces are oriented in the main longitudinally, in Necromites they lie at an angle to the longitudinal axis, resembling in their structure the facis auricularis of seals.

(Par. 8) Besides the structure of os ilium, os ischii and os pubis, the general form of the coxae also well distinguishes Necromites and Semantor. The os ilium of Semantor is of elongated form, its curve in the external side very smooth, extending across through the whole bone. Only the crista iliaca in Semantor is bent on the external side more than in Lutrinae. The os ilium of Necromites is a broad massive bone, immediately after the acetabulum curved sharply on the external side, so that the front half of it occupies, apparently, almost a transverse position in relation to the axis of the vertebral column. The front border of the os ilium of Necromites did not look out apparently at the end of the sacrum, whereas in Semantor the os ilium faced the end of the sacral bone, reaching halfway to the first lumbar vertebra. The facies sacralis of Necromites is oriented in immediate proximity to the acetabulum, almost clasping the front half of it; in Semantor, this joined surface is arranged far in front of the acetabulum. The acetabulum of Necromites is large and very wide, clasping in width almost three-quarters of the thickness of the bone in this place. In Semantor the acetabulum is rather small. The acetabulum of Necromites is bordered in its front half by a very wide and thin wall, as if an independent projection perpendicular to the bone. By this character (as also many others) Necromites differs not only from Semantor but also from

all Pinnipedia examined by us. The level of the arrangement of the acetabulum in relation to the sacral bone is also quite different in Necromites from Semantor. While in Necromites the acetabulum is arranged at the level of the border of the first and second sacral vertebrae, in Semantor it is at the border of the second and third.

(p. 12, Par. 2.) The Os pubis of Necromites differs from the same bone of Semantor both in general form, and in details of structure. In Semantor, the Os pubis is a weakly bent curve, its convex side turned to the dorsal aspect, so that the ventral side of the Foramen obturatum forms an almost straight line. The Os pubis of Semantor at the base has a triangular section, one of the edges passing to the external part. The rear half of it in Semantor is bent in the ventral and median side and at the end passes over into a wide plate. In Necromites in distinction from Semantor the Os pubis in general form is a weak curve, its convex side turned in a ventral direction. The base of the Os pubis of Necromites is very massive, on the same side as in Semantor, but the lateral side of the base of the Os pubis is lacking in Necromites. Somewhat further from the base of Os pubis of Necromites has a rounded-triangular section, the base of this triangle lying on the lateral surface of the bone, and its face bent medially. If one examines the Os pubis of Necromites from the side, it presents the following view. At the base it is wide, then tapers

somewhat, as if forming a very smooth waist. The widest part of the bone is the caudal end of the first third. The second third of it has a gradually tapering appearance. The caudal third of the sciatic bone is a plate of very moderate size, passing smoothly into the Os ischii. In Necromites such a medial bend of the os pubis is not found, in contrast to Semantor. Observed from the right of the os coxae, the caudal piece of the os ischii of Necromites also well distinguishes it from Semantor. In Necromites it is very narrow, a plate oriented in the general direction of the os ischii, in distinction from Semantor, in which this plate is very wide.

One can characterize the differences between the pelvic bones of Necromites and Semantor by the ratio of length of os ilium to the entire length of the pelvic bone. In Necromites the length of the os ilium (measuring from the front border of the acetabulum to the most projecting part of the os ilium) is 24.3%, the length of the same bone in Semantor, 33.5%.

To compare the femur of Necromites with the femur of Semantor is very difficult, seeing that the femur of Necromites is only partly preserved. One has only an insignificant fragment of the ventral part of the head, an imprint of the diaphysis (the femur of Necromites lay in a stratum with a large slope back, therefore the place, left by the diaphysis does not give a full idea of the profile of the bone), and a fragment of the medial condyle. Neither in Semantor, nor in other comparable

animals is the median condyle oriented so distally.

(p. 13, Par. 2.) The structure of the diaphysis of the femur of Necromites also differs from that of Semantor. In Necromites the diaphysis of the femur by comparison with the diaphysis of Semantor is more massive and has a protuberant convex form forward.

Finally, we will cite differences in dimensions. The mean (sagittal) length of the bone, measuring from the head to the projecting part of the medial condyle, is in Necromites 95 mm., in Semantor 78 mm. The saggital diameter of the collum femoris in Necromites is 12 mm., in Semantor 8.5 mm. The width of the distal end of the bone in Necromites is 34 mm., in Semantor 35 mm.

Preserved fragments of tibia and fibula of Necromites in comparison with those of Semantor allow the following to be established. Besides the fact that in Necromites they are of more massive structure than in Semantor, they differ also in mutual arrangement of the medial parts of the condylus medialis et lateralis and in structure of the capitulum fibulae. In Necromites the medial border of the inner and outer condyles and the fibula are arranged in one line, and do not form an arch, as in Semantor. The saggital diameter of the tibia in Necromites is 56 mm., in Semantor 24, 5 mm., the saggital diameter of the fibula in Necromites is 25 mm., in Semantor 15.4 mm.

Comparing the humerus (shoulder bone) of Semantor with that of Necromites, we observed a difference much greater than

in the bones of the hind part of the skeleton. These two bones are very different in form and structure of the different parts. In Necromites, above all, the massiveness and shortness of the humerus is conspicuous. The diaphysis of the humerus of Necromites is level so that the surface of its hind wall is flat. In Semantor, the humerus is of rather well formed and delicate structure. The form of the humeral diaphysis of Semantor was the form of an arch, its convex side turned forward. The humerus of Semantor differs from that of Necromites in form and arrangement of the head. If the antero posterior section of the head of the humerus of Semantor has the form of a little more than a quarter of a circle, that of Necromites is semi-circular.

The deltoid process of the humerus in Semantor projects with the diaphysis in the form of a sharp keel; its anterior border, if examined from the side, is arched, with the convex surface turned forward. In Necromites it has the appearance of widening in front of the diaphysis, and its front border is flat. That is to say, the processus deltoidea of Necromites is very massive and not far-projecting from the body of the diaphysis. The Tuberculum minus of Necromites in distinction from that of Semantor is powerful and almost independently projecting from the body of the diaphysis. The size of the diameter of its broken off part makes one suppose, that it projects as far as the head of the humerus, which is not the case in Semantor. On the inner side of the diaphysis of the humerus of Necromites, there is an

obliquely-arranged ridge formed with the inner-lower end of the processus deltoidea. There is no such ridge either in Semantor or in any of the representatives of the order of Pinnipedia.

Resuming all that has been said, one can conclude the following: Necromites nestoris Bog., described by V. V. Bogachev as a new genus of the fossil family Semantoridae, has a series of sharp differences from Semantor macrurus Orl. S. macrurus in structure of different bones of the skeleton has only the first features of adaptation to an aquatic way of life. In its skeleton it displays still only elementary changes to the side of "seals". N. nestoris together with primitive characters inherent to it alone has very many characters, testifying to its high adaptation to an aquatic way of life, and consequently to a great approximation to seals.

Yu. A. Orlov considered Semantor as a representative only of a lateral branch of the Pinnipedia, leading to its origin away from the otter-like form. In the series otter-seal, Yu. A. Orlov, diverts Semantor from the middle position. As the brought-forward comparisons show, Necromites has no place in this series, at any rate as a middle member. By comparative-anatomical study of the remains of Necromites we did not succeed in discovering in its skeleton any "otter-like" features. We compared the remains of the skeleton of Necromites not only

with Semantor, but also with Lutra lutra L. (1).

In summary, with the strong occurrence in Necromites nestoris of a series of morphological features, which well distinguish it from Semantor, it seems not possible to consider it as belonging to the family Semantoridae.

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