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NEW DATA ON SEMANTOR

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In the summer of 1928, during excavation of large accumulations of remains of the mammalian Hipparion fauna (Hipparion, rhinoceroses, giraffes, antelopes, etc.) associated with the freshwater upper Tertiary deposits of the right shore of the Irtysh River region (in the region of CUSIN Cressing [?] 1.5 km. downstream from the town of Pavlodar), was discovered the hind half of a skeleton of a very peculiar aquatic mammal, possessing at the same time features of seals (Pinnipedia) and otters (Lutrinae).

Numbered among the discovered bones of this animal in the original occurrence are: posterior lumbar vertebrae, the crus, tail vertebrae (except for the last), the pelvis, and both hind limbs (Orlov, 1931a). They were buried in cross-bedded, ocherous, micaceous sands of the fluvial type, forming one of the bottom horizons of the Neogenic series of the Pavlodar section. The geological age of this horizon, as also those neighboring with it, is not up to the present established, but for now may be referred to as upper Miocene to lower Pliocene (Gromov, 1940; Beliaeva, 1948). The disposition of the imbedded bones which are our concern suggest that here we have a situation where the main stream of a Tertiary river carried down the corpses of perished mammals.

Careful comparative-osteological work on the fossils by Yu. A. Orlov (who likewise discovered the remains) showed that some of the elements of the skeleton (pelvis, femur, tibia and tibula, cubitus, second cuniform bones, first and fifth metatarsals) have a typically pinniped structure and in some respects approach the skeleton of hair seals (Phocidae); other parts

(lumbar vertebrae, crus, tail vertebrae) disclose a certain similarity with otters; the rest of the studied bones occupy a morphologically intermediate position between the corresponding parts of the skeleton of seals and otters (Orlov, 1933).

Considering that the species of mammal discovered near Pavlodar differs in osteological characters from every family of seals known to us (fur seals, walruses, hair seals) more than the latter differ from one another, Orlov (1931a, b; 1933) described it as the type form of a new family of seals, the Semantoridae, represented by one genus and species - Semantor macrurus Orlov, 1931.

The morphological peculiarities of the bones of the rear end of Semantor indicate its comparatively high degree of adaptation to aquatic life. Also, judging from the articulation of the tibia with the astragulus, [P. 511.] There was retention of the ability to flex and straighten the hind feet on the shank; this is evidence therefore of a mode of life with freedom to move on the land.

In the opinion of Yu. A. Orlov, Semantor was better adapted to travel better on land than all other present-day pinnipeds (including otarids and walruses), but not as capable in that respect as the inherently terestrial carnivores. Nevertheless, the ability of Semantor to swim was developed in many ways more strongly than the ability to travel on solid surfaces. Probably in swimming it made use of the caudally stretched-out hind limbs, as this is done in seals. As a supplementary swimming organ it employed the long tail, which for the comparatively small size of Semantor (not exceeding an average-sized adult dog) was larger than that of a large walrus. Besides this, the tail was noteworthy not only in the large size of its vertebrae, but also in the strong development of extensions serving for attachment of ligaments and muscles (Orlov, 1931a, 1933).

Yu. A. Orlov considers that Semantor was the fastest of all the littoral carnivores of the Neogene lakes and rivers of western Siberia and eastern Kazakhstan. It was agile not only in the water but also on land, even though the main element for it was precisely water, and not land.

In the opinion of Yu. A. Orlov, this contemporary of the Siberian Hipparion fauna, Semantor, is undoubtedly a side-branch of seals, and cannot be considered ancestral to the surviving families of Pinnipedia owing to its relatively recent geological age (it can hardly be older than late Miocene). Besides, in the Upper Miocene deposits, remains of seals are discovered which are very near the modern ones in their osteological particulars. While admitting the relative closeness of Semantor to Phocidae and Lutrinae, Yu. A. Orlov rightly pointed out that a definitive conclusion on the phylogenetic position of this unusual animal would be possible only when other parts of the skeleton are known.

Now we are able to communicate certain new data on this interesting mammal.

In the Paleontological Institute of the Academy of Sciences of U.S.S.R. recently was entered a shoulder bone (humerus) of Semantor (fig. 1), discovered by V. I. Gromov in 1934, on the right bank of the Irtysh River near Paviodar, in that same section where Yu. A. Orlov had discovered the rear half of the skeleton of the original animal[1].

In spite of the fact that this bone was found in isolation from the previously discovered bones of the skeleton, a few facts suggest that it belongs to the same species - Semantor.

[1]The author expresses sincere acknowledgement to Prof. V. I. Gromov for permission to report on the bone of Semantor which he discovered.

Some indications of this are:

1) The morphological appearance of the bone, indicating a high degree of adaptiveness to an aquatic way of life along with certain characteristic differences from the corresponding bone of fossil and living seals; 2) the resemblance in color and extent of fossilization of this bone with the bones described by Yu. A. Orlov as Semantor; 3) the correlation of the find with the very same horizon and regional location in which was discovered the half-skeleton of Semantor.

On the whole, it is possible that the above mentioned humerus and the earlier discoveries of Yu. A. Orlov belong to one and the same individual of Semantor.

[P. 812] The discovery of V. L. Gromov is a humerus of the left limb of Semantor, lacking the lower third of the distal end. It is a little longer than the shoulder bone of the present Caspian seal (Phoca caspica Omol.) and approximately the same in overall size to the same bone of the ringed seal (Phoca hispida Schreb.)

The shaft of the bone is strongly curved along its length - anteriorly convex. The deltoid ridge is very high, narrow and long; it occupies not less than ? of the length of the entire bone. The ridge does not have a broad surface for attachment of muscles on its anterior side. In cross section the shaft of the bone is a narrow triangle, with a strongly protruding anterior angle at the place of the deltoid ridge. The posterior surface is not on the whole a sharp crest changing below into a very full crest of the lateral superior muscle (crista epicondylus lateralis). The lower third of the posterior surface has a lengthwise groove deepening in the distal direction.

The external surface of the shaft, under the deltoid crest, curves

in the form of a wide lengthwise groove. The bicepital groove is wide, its edge not bending into the side of the groove. The head of the bone is large, slightly longer front-to-back.

Measurements (in mm.): greatest diameter of shaft (with deltoid ridge) - 30; greatest width of the proximal end - 32; width of bicepital groove - 15; overall length of preserved part of the bone (missing the distal tip) - 78; antero-posterior cross section of head - 24; width of head - 22.

In general appearance the humerus here described is very reminiscent of the corresponding bone of living hair seals (Phocidae). However, they differ not a little in details of morphology. In Semantor, for example, the wide surface on the edge of the deltoid ridge is absent; this is characteristically found on the humerus of modern hair seals. Also the deltoid ridge itself is significantly longer in Semantor (in living Phocidae, it occupies about half of the length of the entire bone). The crista epicondylus lateralis of Semantor is considerably higher. The bicepital groove on the bone of Semantor is considerably wider and more open. The head of the humerus of the animal being described here is slightly elongated from front to back (in Phocidae it is rounded.)

The humerus of Semantor is a little closer to that of a fossil seal (Phoca sp.) of marine deposits of the Upper Miocene of Moldavia (vicinity of Kishinev, Middle Sarmatian; coll. PIN No. 1713-119). The deltoid crest on the bone of this seal is similarly long and narrow, as in Semantor, as to indicate a similar attachment of muscles. In the remaining characteristics, the same differences are found between this fossil seal and Semantor as shown above between Semantor and the modern hair seals.

Much more noticeably and sharply distinct is the humerus of the

river otter from that of Semantor. Particularly, the bone of the otter is narrower, the shaft is straight, and rounded in cross section; the deltoid ridge is low, wide, and descends not far from the middle of the bone; the head of the bone is relatively small; the crista epicondylus latoralis is lower and deflected outwards (deflected backwards in Semantor, the groove-like cavity is not expressed on the hind surface of the bone of the otter.

Thus, a comparison of the shoulder bone of Semantor with the corresponding bones of some hair seals and the river otter allows us to form an opinion: Semantor undoubtedly belongs to the pinnipeds and is near to the hair seals (a similar conclusion as [P. 813] reached by Yu. A. Orlov as a result of earlier research), but, on the other hand, this mammal shows relatively less resemblance to the otters.

In spite of the definite closeness of the skeleton of Semantor to Phocidae, it is a considerable extent separated from this group, indicating the specialized characters of this mammal. From all that can be seen of Semantor, we may consider that it represented a very peculiar extinct group of pinnipeds, to a considerable extent of hair-seal form adapted to life in the large freshwater lakes and rivers or estuaries, but possessing relatively great mobility on land. A certain superficial resemblance to otters in the structure of separate elements of the axial skeleton of Semantor cannot be employed as reliable indications of their immediate phylogenetic affinity.

It is necessary to mark the resemblance of morphological appearance of the humerus of Semantor with the humerus of the fossil seal of the Middle Sarmatian of the Miocene, which may demonstrate the possibility of relating links between this freshwater pinniped and the hair seals inhabiting the vast Middle Sarmatian basin.

The opinion of the Austrian Paleontologist Thenius (1949) that

Semantor in systematic position represents no more than a highly specialized species of a subfamily of otters is erroneous. It was arrived at by that author not on the basis of the study of new actual material, but by applying incorrect wholly mathematical methods to the descriptive data in the work of Yu. A. Orlov (1933). From these data, Thenius calculated the percentage correspondence of the characters with otters and seals. Thus Thenius obtained the result that in the structure of the hind part of the skeleton of Semantor are 55.5% characters of otters, 6% characters of pinnipeds, and 38.5% intermediate. Thenius wholly accounted for the high degree of adaptation to aquatic life and traits of resemblance with seals as being the result of convergence.

In connection with these conclusions, Thenius continually emphasizes that the percentage of relationship of distinct groups of characters cannot be used as a reliable criterion to estimate the systematic position of this or any other animal, since it does not reflect the real variety of structure of the skeleton and leads to extreme sketchiness.

As far as is known, the late Paleogene sea did not extend into the territories of eastern Kazakhstan and western Siberia. Consequently, it is of particular interest to find bones of Semantor, in that they were found at a very great distance from the shores of the sea, which in late Miocene occurred not nearer than the present Aral Sea, and was still more distant in subsequent stages of geological history. Of course this does not completely exclude the possibility of migration by such an active animal as Semantor from the Neogene sea into the freshwater basins of the concerned area by systems of rivers and lakes.

The anterior limbs of seals are used to control motion in the water. Thus the well-expressed pinniped-like arrangement of the humerus of

Semantor bears witness to the very high ability of this animal to swim, being, we can imagine, at the same level as in the Sarmatian seals from the similar development of their deltoid ridges.

Allowing for this high degree of adaptation to swimming, in many ways more than the modern river otter, we can presume that in the region of the present Main Stream of the Irtysh River, at the end of the Neogene, there were P. 814 large lakes and rivers; only in this setting could be found use for such a peculiar combination of adaptations.

As food, Semantor could have used large fish, water birds, possibly even aquatic rodents. We can judge on the wealth of the freshwater Neogene ichthyofauna in eastern Kazakhstan and western Siberia, as far as present knowledge allows, from the fact that fossils of fishes are preserved and described in the work of B. A. Shtyl'ko (1934).

The collection of Neogene freshwater fishes (22 species) was gathered by N. K. Vysotski in 1895 from the right bank of the Irtysh, 55 km. north of Omsk (Livenki and Serebryanskee villages) in a horizon of Neogene stratum which included fine - and coarse-grained micaceous sands of gray, greenish, and in places ocherous colour - that is, in lithological and stratigraphical nature similar to the beds in which the remains of Semantor were found. Later, V. V. Bogachev, studying an even earlier collection, took the age ascribable to this ichthyofauna to be Pliocene, pointing out as well that the group itself had a fluvio-lacustrine character. It is quite possible that Semantor was contemporary with this ichthyofauna and inhabited the same fluvio-lacustrine waters.

In the opinion of B. A. Shtyl'ko (1943, p. 68) "the climatological conditions in which this fish fauna evolved and in which it existed at least at the beginning of the Upper Tertiary, were similar to those of present southern Europe, and might even have been subtropical". This

conclusion is based on the fact that "in all the present-day ichthyological faunas, the largest resemblance to the fossil fish fauna of the Irtysh is found in Europe, precisely in southern Europe". (op. cit. p. 72). Likewise it is possible to judge from the specific composition of mammals buried together with Semantor and from the presence in these same deposits of remains of Struthio sp., that the climate of that region in the top of the Neogene was apparently moderately warm, and the predominant landscape consisted of steppe and forested steppe (possibly like a type of African savannah).

This is the short conclusion which can be made to date on the factual data on Semantor. A further development of this, leading to greater precision, and a change in our basic understanding, might follow if we manage to find and study the skull of this very interesting mammal.

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