

DESCRIPTION OF A NEW GENUS AND SPECIES OF FOSSIL SEAL FROM THE MIOCENE OF MARYLAND.

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While engaged in collecting fossils for the United States National Museum from the Miocene cliffs bordering the Chesapeake Bay in Calvert County, Maryland, known as the "Calvert Cliffs," I found a few fossil bones which are unmistakably those of seals. These bones, as I have already remarked in a recent number of *Science*,^a are, so far as I am aware, the first authentic remains of fossil seals found in America. They consist of a nearly perfect humerus, the radius of a young individual (without epiphyses), a fragment representing the proximal end of the conjoined tibia and fibula, and an imperfect lumbar vertebra. The humerus is light gray in color, but the other bones light brown.

In the same locality with these remains was found a larger humerus, which at first I thought might be that of a seal, but on closer examination it appears to be that of a sirenian, belonging, perhaps, to the Halitheriidae and allied to *Metaxytherium*. It is broken and considerably waterworn, so that its original form can not be certainly determined. For that reason, I do not think it necessary to devote any further attention to it in the present connection, though it appears to represent a sirenian type not hitherto found in America. It is figured on Plate LXXVI, fig. 4 (Cat. No. 5360, U.S.N.M., Vert. Paleon.).

The smaller humerus already mentioned, though lacking the head and the extremity of the lesser tuberosity, is so well preserved that its characters are plainly discernible. It obviously represents a species belonging to the family Phocidae, and a genus allied to *Phoca*, but is not identical with that genus nor any other existing genus of the family. As a means of individualizing it, I propose to establish for it the new genus *Leptophoca*. The following are the characters as far as can be drawn from the humerus:

^a *Science*, n. s., XXII, p. 794, Dec. 15, 1905.

LEPTOPHOCA, new genus.

An extinct phocine pinniped mammal, having the humerus more slender than in any existing genus of seals. Deltoid ridge well developed and broad at the upper, or proximal, end, but narrowing rapidly below and terminating in a thin edge, which, at a point considerably below the middle of the bone, joins at an obtuse angle the ridge running to the inner edge of the trochlea. Lesser tuberosity only moderately developed, the bicapital groove between it and the greater tuberosity very narrow relatively. Entepicondylar foramen present. *Type of the genus.*—*Leptophoca lenis*.

LEPTOPHOCA LENIS, new species.

Size, as determined from the humerus, about that of *Phoca granulatica*. (See Plate LXXV, fig. 1.) Least transverse diameter of shaft of humerus less than one-seventh the length. Breadth from entepicondylar foramen to supinator ridge less than one-fourth the length. Internal face of deltoid ridge plane. Root of the lesser tuberosity not forming a strong ridge on the internal face of the shaft.

Measurements of humerus.—Total length, 129 mm.; least diameter of shaft, transversely, 17; *ditto*, antero-posteriorly, on exterior side, 27; diameter of shaft at insertion of head, posteriorly, 26; distance from distal end of deltoid ridge to center of trochlea, 58; greatest breadth on line of proximal margin of trochlea, anteriorly, 38; breadth from entepicondylar foramen to supinator ridge, posteriorly, 30; greatest breadth of trochlea, anteriorly, 24; breadth of entepicondylar foramen, 2.5.

Type-specimen.—No. 5359. U.S.N.M., Vertebrate Paleontology. Humerus, from Calvert Cliffs, Calvert County, Maryland, between Chesapeake Beach and Plum Point. Collected by F. W. True, June 20, 1905. Plate LXXV, figs. 2-4.

Leptophoca lenis was probably about the size of *Phoca granulatica*. The humerus of the latter, while of almost exactly the same length, is much thicker, and the deltoid ridge, as in all existing seals, is thick distally as well as proximally. The lesser tuberosity is much more massive than in *Leptophoca* and is separated from greater tuberosity by a very wide bicapital groove.

The genus *Monachus*, with which several genera of fossil seals have been compared, differs in that the shaft is quite straight, the bicapital groove wide, and the entepicondylar foramen absent.

On account of Dr. J. A. Allen's careful analysis of the data relating to supposed species of American fossil seals, described or mentioned by Leidy and other paleontologists,^a it does not seem necessary to consider them in detail in this place. His conclusion, namely, that not a

^aJ. A. Allen, North American Pinnipeds, 1880, pp. 469-476.

single extinct species has been certainly determined, appears, in the light of the evidence, entirely valid.

It is well known that P_r. J. Van Beneden established several genera and species for remains of fossil pinnipeds found in the Tertiary of Antwerp, Belgium. These are described very fully and accurately figured in the Annals of the Belgium Museum of Natural History.^a

The genera of Phocidae are *Mesotaria*, *Palaophoca*, *Callophoca*, *Platyphoca*, *Gryphoca*, *Phocænella*, *Monatherium*, and *Prophoca*. A species of *Phoca*, called *P. vitulinoides*, is also described. Taking these in order, the differences from *Leptophoca* which the humerus presents are as follows:

In *Mesotaria* the size is greater than in *L. lenis*, the bicipital groove is strongly developed, and the entepicondylar foramen is absent. In *Palaophoca* the shaft is straight, as in *Monachus*, and the entepicondylar foramen is absent. In *Callophoca* the humerus is massive, with the deltoid ridge short and very strong, and no entepicondylar foramen. In *Platyphoca* the size is large and the form massive, the lesser tuberosity little developed, deltoid ridge short, shaft straight, with the external face convex. In *Gryphoca* the deltoid ridge is very strong and the bicipital groove wide and deep. In *Phocænella* the deltoid ridge is very short and broad. In *Monatherium* the size is large and the form massive; the shaft is straight and the deltoid ridge thick.

The genus *Prophoca* merits more detailed consideration. Under the generic heading, Van Beneden remarks only the following, as regards the humerus: "The humerus has one of the sides of the bicipital groove quite straight and compressed."^b He places two species in the genus, *P. roussseau* and *P. proxima*, remarking that they are nearly the same size. It would seem from the figures, however, that the former is much larger than the latter. Of *P. roussseau*, Van Beneden remarks as follows: "The humerus is distinguished from all the others because it is more robust and straighter, the deltoid ridge is little curved and its internal face is scarcely concave, while in all other seals it presents a deep fossa. The bicipital groove is also less deep and is terminated above by the greater tuberosity, which is very strong and much elevated. The posterior face (of the humerus) is not concave below the neck, as in the other genera."^c Of *P. proxima*, he remarks: "The humerus is straight, as in the preceding species and differs in that particular from existing species. The head is quite large and the neck little pronounced. The greater tuberosity is abraded, but it does not appear to have had the degree of development nor the height found in the ordinary seals. The deltoid ridge is straight, so that the bicipital

^aP_r. J. Van Beneden, Description des Ossements Fossiles des environs d'Anvers, Ire Partie, Pinnipèdes ou Amphithériens, Ann. Mus. Roy. d'Hist. Nat. Belg., I, 1877, texte et planches.

^bIdem, p. 78.

^cIdem, p. 79.

groove is shallow and but little curved (*ondulé*). The external face of the ridge is concave as far as the neck. The entepicondylar foramen is perfect. The internal tuberosity is raised into a thin ridge toward the posterior face."^a

These two species, while they present certain similarities, as indicated by the figures published by Van Beneden,^b seem to me to differ in so many details, at least as regards the humerus, that they can hardly be considered as belonging in the same genus. The principal resemblance between them is in the flatness of the inner face of the deltoid ridge, or, in other words, the shallowness of the bicipital groove. On the other hand, the two forms, aside from marked disparity in size, present numerous differences. In *P. rousseaui* the humerus is very massive and the profile of the shaft has nearly the same concavity on the two sides, while in *P. proxima* the humerus is slender and the external profile of the shaft nearly straight, and the internal profile is strongly concave. Again, the posterior profile of the shaft is concave in *P. rousseaui* and straight in *P. proxima*. In the former the free margin of the deltoid ridge is thick throughout and bends down gradually to the general surface of the shaft distally, while in *P. proxima* it is thick in upper portion, but diminishes suddenly in breadth at about the middle of its length, forming a distinct thin edge distally. Its distal termination joins the shaft at a sharp angle. The lower portion of the humerus of *P. rousseaui* is wanting, and it is not known, therefore, whether there is an entepicondylar foramen in this species.

On account of the differences above mentioned, I am inclined to consider *P. rousseaui* as the type and only species of the genus *Prophoca*. *P. proxima*, as far as may be judged from Van Beneden's figures, presents the peculiar feature of a thin-edged deltoid ridge, much as in *Leptophoca*, but as it differs in that the shaft of the humerus is straighter and that the concavity below the neck on the posterior face of the shaft is lacking, I am uncertain as to whether it should be referred to that genus. It is a little larger than *L. lenis*.

A considerable number of other species of European fossil seals have been described more or less fully by various authors. The majority of these are not comparable with *Leptophoca*, having been founded on teeth or on bones belonging to parts of the skeleton different from those on which *Leptophoca* is based. Of the two or three in which the humerus is known, the form from Bessarabia described and figured by Nordmann in 1860 under the name of *Phoca maotica*^c shows a close affinity to *Leptophoca*. The humerus is almost of equal size, and in its general form and characters and in many details, as judged

^a P. J. Van Beneden, Description des Ossements Fossiles des environs d'Anvers, 1re Partie, Pinnipèdes ou Amphithériens, Ann. Mus. Roy. d'Hist. Nat. Belg., I, 1877, texte et planches, p. 80.

^b Idem, pl. xviii.

^c A. Nordmann, Paleontologie Sudrüsslands, IV, 1860, pp. 313 and 317, pl. xxiii, figs. 1, 2.

by Nordmann's figures, it presents very close similarity. It appears to differ, however, in that the distance from the distal end of the deltoid ridge to the trochlea is much less than in *L. lenis* and that the transverse breadth of the bone opposite the entepicondylar foramen is considerably less; the external face of the ridge appears to be convex rather than concave. I have no hesitancy in referring *Phoca maotica* to the genus *Leptophoca*, but it probably represents a species distinct from *L. lenis*.

Other bones from the Calvert Cliffs, Maryland, which are probably, but not certainly, referable to *L. lenis* are figured on Plate LXXVI, figs. 1-3. They consist of the proximal end of the conjoined right tibia and fibula, a lumbar vertebra (last), and the right radius of a young individual. These were collected by me at the same locality as the type of *L. lenis*, and in size and general appearance suggest specific identity.

The fragment of the tibia and fibula resembles the same part in *Phoca groenlandica*, but is somewhat smaller and more slender and delicate. In its general conformation, however, it approaches nearer to *Halichærus*, especially in the position of the proximal end of the fibula, which is on a level with the proximal end of the tibia, and in the convexity of the internal face of the tibia. The anterior and posterior faces of the tibia^a are very deeply concave, the bone between them being very thin.

The lumbar vertebra lacks the transverse processes and metaphyses and the neural spine, but the neural arch is complete and the anterior zygapophyses. From the shape and position of the portions of the processes remaining, it is probable that the bone is the posterior lumbar. It resembles the same vertebra in *P. groenlandica*, but is considerably smaller, and the anterior zygapophyses are much more concave and are directed upward rather than inward. The median depression of the posterior epiphysis of the centrum is much below the level of the depression of the anterior epiphysis. The radius (right), which is that of a young animal, lacks the head and distal epiphysis. It presents no salient characters, except that the tuberosity is large and is situated high up toward the neck.

The dimensions of the foregoing bones are as follows:

Tibia and fibula.—Total length of fragment, 59 mm.; breadth at proximal end, 51; transverse breadth of condyles, 41; antero-posterior breadth of larger condyle, 26; of internal surface of tibia, 21.

Lumbar vertebra.—Length of centrum, 33 mm.; breadth of anterior epiphysis, 27; depth of same, 23; vertical height of neural arch, anteriorly, 12.

Radius.—Total length (head and epiphysis lacking), 78 mm.; greatest breadth at distal end, 30; at proximal end, 16; least diameter of shaft, 13.

^aIn a seal, as the hind legs are directed backward, these surfaces are actually external and internal in relative position.

The exact position in the Miocene to which *Leptophoca* belongs is a matter of much interest, and, fortunately, some light is thrown on that subject by the fossil shells found in the marl adhering to the type-specimen. These have been identified by Dr. William H. Dall, who kindly took them in hand at my request, as representing *Venus rileyi* and a species of *Crassatellites*. Reference to Prof. George B. Shattuck's article on the Geological and Paleontological Relations of the Maryland Miocene^a shows that *Venus rileyi* and *Crassatellites melinus* have been found together in the Calvert Cliffs only in zone 10, and at a point 1 mile north of Plum Point; or, in other words, 2 or 3 miles south of the point where the bones of *Leptophoca* were found. While species of *Crassatellites* have been found in other zones of the Calvert Cliffs, *Venus rileyi* appears to occur only in zone 10. It seems highly probable, therefore, that *Leptophoca* belongs to this zone of the Calvert formation. The Calvert formation represents the Lower Miocene, a fact which is of interest because the majority of Van Beneden's genera and species are assigned to the Pliocene. Only *Monatherium* and *Prophoca* are assigned to the Miocene, and even these to the Upper rather than to the Lower Miocene. It is to be noted, however, that the "sable noir" in which *Prophoca* occurs is associated by Van Beneden, on the authority of Nyst, with the Miocene of the Vienna Basin,^b which formation Zittel places on the Middle Miocene.^b The Tertiary beds of Bessarabia, in which the remains of Nordmann's *Phoca maeotica*, the nearest relative of *Leptophoca lenis*, were found, are also assigned to the Middle Miocene.

EXPLANATION OF PLATES.

PLATE LXXV.

- Fig. 1. Right humerus of *Phoca granlandica*. Anterior view.
 2. Right humerus of *Leptophoca lenis*. Cat. No. 5359, U.S.N.M. Vert. Paleon. Type. Anterior view.
 3. The same. Posterior view.
 4. The same. External view.
 (All the figures a little less than natural size.)

PLATE LXXVI.

- Fig. 1. Right radius of *Leptophoca lenis?* Exterior view. Cat. No. 5362.
 2. Proximal end of conjoined tibia and fibula of *Leptophoca lenis?* Anterior view. Cat. No. 5361.
 3. Posterior lumbar vertebra of *Leptophoca lenis?* Dorsal view. Cat. No. 5363.
 4. Humerus of a fossil sirenian from the same locality as *Leptophoca*. Anterior view. Cat. No. 5360.
 (All the figures natural size.)

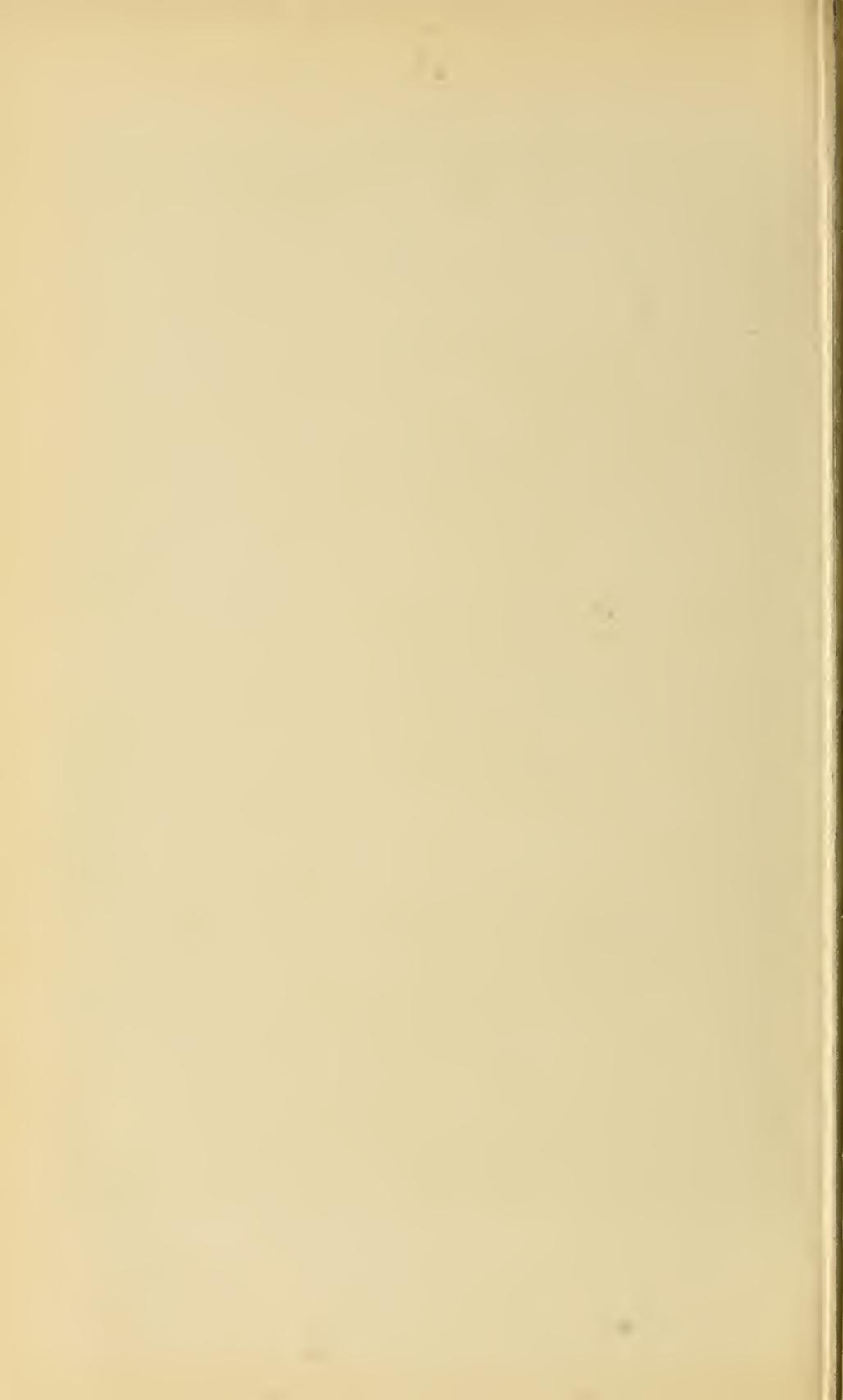
^aG. B. Shattuck, Geological and paleontological relations, with a review of earlier investigations, Rept. Maryland Geol. Surv., Miocene, Text, 1904, pp. lxxxvi to xcii.

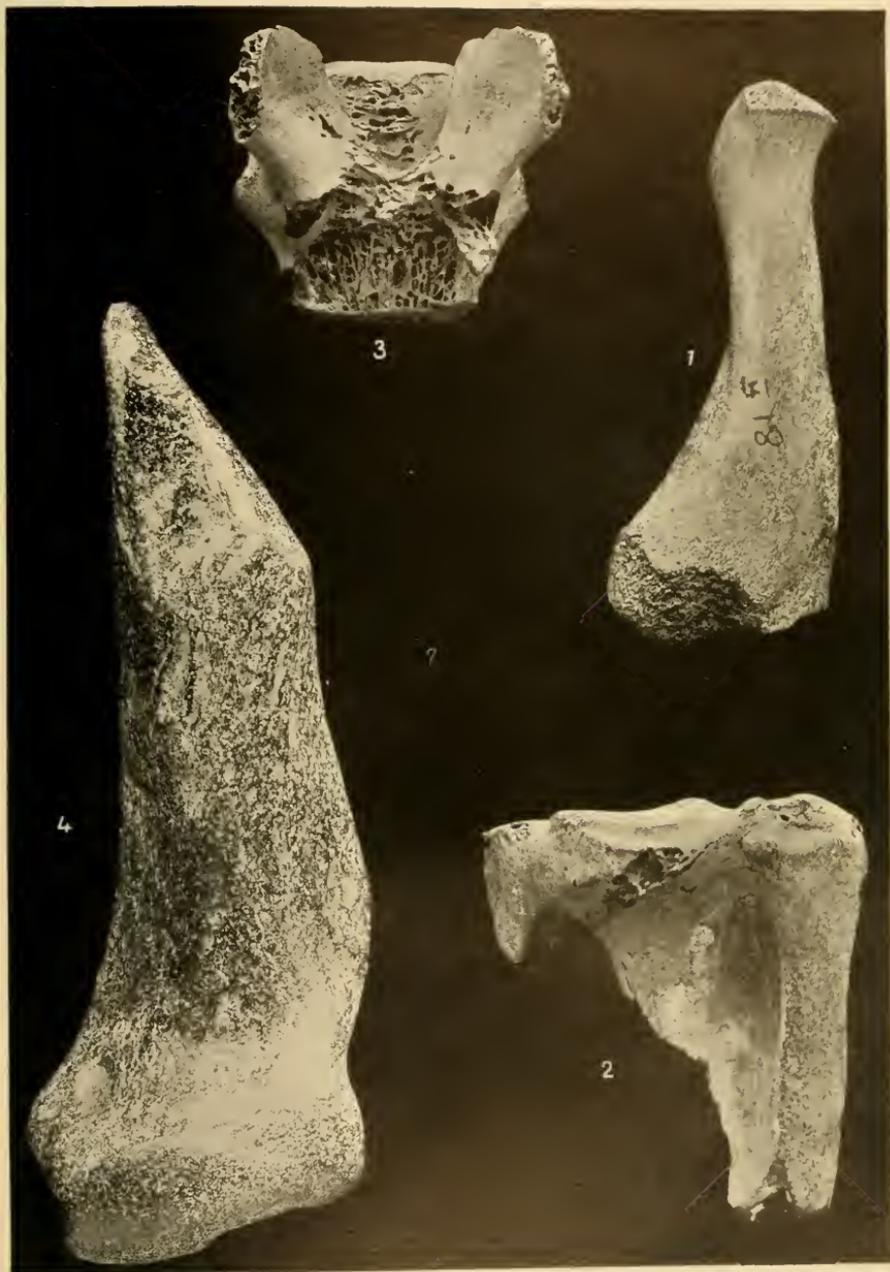
^bP. J. Van Beneden—Description des Ossements Fossiles des environs d'Anvers, 1re Partie, Pinnipèdes, Ann. Mus. Roy. d' Hist. Nat. Belg., I, 1877, p. 79.



HUMERUS OF LEPTOPHOCA LENIS AND OF PHOCA GRÆNLANDICA.

FOR EXPLANATION OF PLATE SEE PAGE 840.





BONES OF LEPTOPHOCA LENIS AND OF A FOSSIL SIRENIAN.

FOR EXPLANATION OF PLATE SEE PAGE 840.

