

ART. XL.—*Prorosmarus alleni*, a new genus and species of Walrus from the Upper Miocene of Yorktown, Virginia; by EDWARD W. BERRY and WILLIAM K. GREGORY.

DURING a recent excursion of one of the classes in geology of the Johns Hopkins University, one of the students, William E. Curley, Jr., found on the beach at Yorktown, Va.,* a left mandibular ramus of a new extinct mammal evidently allied to, but much more generalized than the existing species of walrus, *Odobænus rosmarus* and *Odobænus obesus*. The specimen was presented to the Department of Geology of the University, where it is now deposited under the care of Professor William Bullock Clark, who has generously entrusted it to the present writers for identification and description.

The new genus agrees with *Odobænus*: (1) in the general characters of the mandible; (2) in the general location of the mental foramen, which is in each case followed by a much smaller foramen; (3) in the cylindrical shape of the cheek teeth. In other characters *Prorosmarus* is much more primitive and approaches the Otariidæ or Eared Seals in the following features: (1) The mature jaw retains two well developed incisors in each ramus as in the young walrus, the adult walrus lacking the incisors. (2) The canine retains its primitive position and caniniform shape, whereas in the walrus the canine has been taken over into the molariform series, as shown by its biting against the molariform outer upper incisor and by its separation from the molariform series in the young jaw. The interpretation of this tooth as a canine in *Odobænus* was adopted by Flower, Huxley, and J. A. Allen† in the solution of the long vexed question of the homologies of the unique dentition of the walrus. (3) The inner side of the lower canine of our specimen is considerably worn, and hence to judge from the conditions in other Pinnipeds the upper jaw must have retained three functional incisors in the adult. (4) Viewed from the side the whole ramus is less curved downward and the chin and symphyseal surface is much more slender and slopes more forward than in *Odobænus*, but is much heavier and more roundly developed than in the Otaries. The posterior half of the ramus is thus relatively deeper and the anterior half is relatively shallower than in *Odobænus*. (5) The opposite symphyseal surfaces did not be-

*These late Tertiary littoral deposits have been recently recognized by Clark and Miller as distinct from the underlying beds and formally named the Yorktown formation.

†See summary in Allen's "History of North American Pinnipeds." Washington, 1880, pp. 47-57.

come anchylosed as is the case in even the young walrus, but remained separate, although the deeply corrugated surfaces were closely appressed and doubtless firmly bound together by ligament. (6) The coronoid process is relatively higher, more

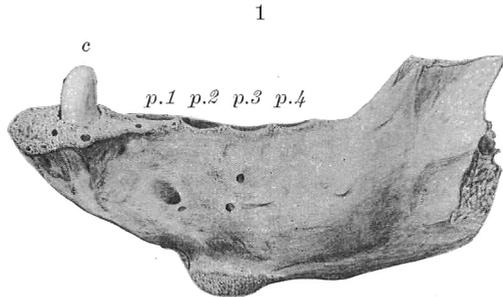


FIG. 1. The type of *Prorosmarus alleni*, lower jaw (left ramus), external view. One-third natural size.

slender and more inclined backward than in *Odobænus*. (7) Viewed dorsally, the opposite mandibular rami rapidly converge to a point opposite the first "molar" when they sud-

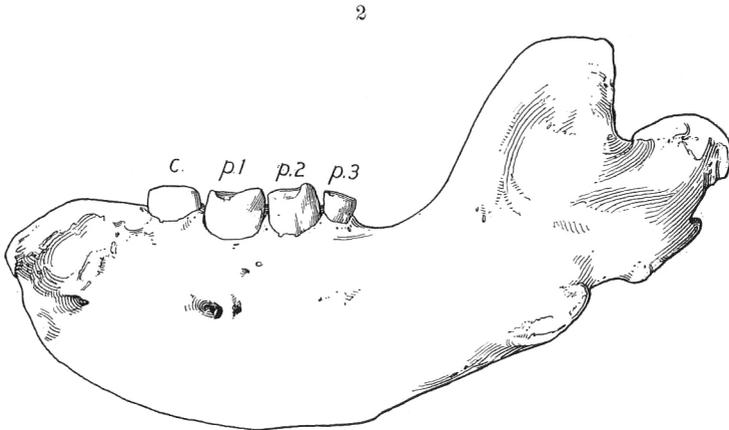


FIG. 2. Lower jaw (left ramus), external view, of an old male Atlantic Walrus (*Odobænus rosmarus*). One-third natural size.

denly expand into a broad spatulate everted lower lip. In cross section this region is broad at the top, narrowing rapidly below (figs. 1, 4A). In *Odobænus*, on the contrary, the rostrum is much compressed above and broadly convex below (figs. 2, 4C). (8) In *Prorosmarus* on the lower border of the jaw below

the second and third "molars" is a prominent rounded protuberance about 4^m long and gradually fading away posteriorly. This protuberance may have furnished attachment for ligaments binding the rami together as well as for the digastric muscle which depressed the jaw. In the modern walrus this process is indicated in the young jaw, but becomes strongly inflected, lengthened, and less conspicuous in the adult. Additional and less important differences from *Odobœnus* are as

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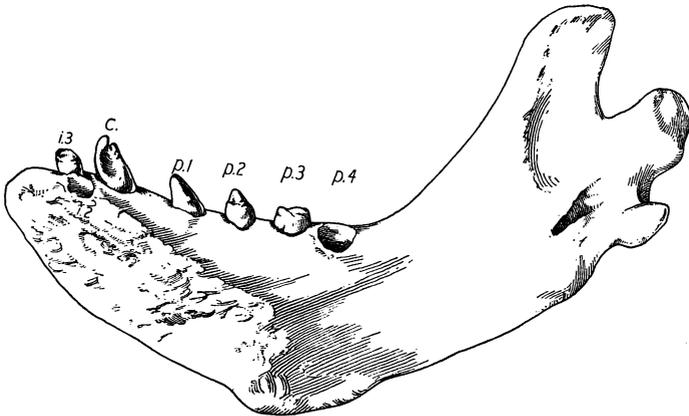


FIG. 3. Type lower jaw (right ramus) of *Alachtherium cretsii* DuBus. Internal view, one-fourth natural size. (After Van Beneden.)

follows: (9) The subequal size of the molariform teeth which in *Odobœnus* successively decrease in size, the most anterior (*c*) being the largest. (10) The molars must have been circular in section whereas in the adult walrus they are laterally compressed. The molariform teeth probably also had a somewhat more pointed tip than in *Odobœnus*. (11) *Prorosmarus* retained one more fully functional molariform tooth (*p*₄), which is vestigial or absent in the walrus.

In brief the jaw of *Prorosmarus* seems to be much less specialized than is the modern walrus jaw. In the latter, doubtless in response to the need for an effective crushing apparatus, the distal portion of the jaw has become very massive; the enormous growth of the upper canines has caused the disappearance of the incisors and the transference of the lateral upper incisor and the lower canine to the molariform or cheek series; the effective center of the lower molar series has gradually been shifted forward and the upper molar series have acquired oblique wearing surfaces, so that the shock of impact is partially transmitted to the massive upper canines.

The detailed description of the specimen is as follows:

Prorosmarus alleni gen. et sp. nov.

Mandibular ramus complete except posteriorly, the coronoid process and the region of the mandibular angle being broken off at a point which leaves the inferior dental canal (8^{mm} in diameter) centrally located and on a horizontal line with the alveolar border. The jaw is extremely massive throughout and is vesicular anteriorly and along the alveolar region. The *canine* alone is in place and from its worn appearance indicates an old animal, as does also the character of the whole specimen.

Dental formula.—The *dental formula* of the lower jaw is $I_{\frac{2}{2}(i_2, i_3)}, C_1, P_{4(p_1-p_4)}, M_0$, but judging by analogy with the walrus one or more of the true molars may have been present in the young jaw, and even as vestiges, without alveoli, in the adult. It would be interesting to know whether the milk teeth were better developed than in *Odobœnus*, as Flower believed that in *Odobœnus* the vestigial milk teeth “never cut the gum, but are absorbed rather than shed,” this process commencing before birth. In the upper jaw there must have been three incisors (the existence of the outer pair being plainly indicated by the worn antero-internal face of the lower canine), a canine not nearly so much enlarged as in *Odobœnus*, four premolars and possibly one or more much reduced molars. The outer lateral incisor, like its opposing tooth the lower canine, had not yet been taken over into the molariform series. Thus the complete dental formula of the adult was probably $I_{\frac{3}{2}}, C_1, P_4 M_{\frac{2}{2}}$.

The *internal incisor* (i_2 of the typical Eutherian formula) was evidently considerably reduced in size as compared with the other teeth, but still functional, and was apparently retained in the specimen until after the death of the animal. It is placed almost behind the outer incisor, decumbent, directed forward at an angle of about 45°. Alveolus round, 8^{mm} in diameter and 2^{cm} in depth. The *outer incisor* (i_3) is large, approximately paralleling the canine in direction. Alveolus 13×15^{mm} in diameter, the longest diameter being transverse; depth 5^{cm}.

Canine—Bluntly conical, directed slightly forward and outward and curving slightly backward, nearly circular at the base in cross section but slightly flattened anteriorly. Much worn on the antero internal quadrant, presumably by the attrition of the upper outer incisor. Height 2·2^{cm}, diameter 1·7^{cm}, diastema 1·4^{cm}. The premolars were all rounded, simple and deep-set. The first alveolus indicates a vertical, slightly forward direction and is 1·7^{cm} in diameter and 4·4^{cm} in depth. The second alveolus indicates a slight outward and forward direction and is 1·8^{cm} in diameter and 4^{cm} in depth. The third alveolus is very slightly

Alachtherium cretsii DuBus (figs. 3, 4B) and "*Trichechodon*" *koninckii* Van Beneden from the lower Pliocene (Scaldisien, probably homotaxial with the Plaisancien of the Mediterranean region) near Anvers in Belgium, and *Trichechodon huxleyi* Lankester from the "red crag" of Suffolk, England, have been fully described and figured by Van Beneden in his

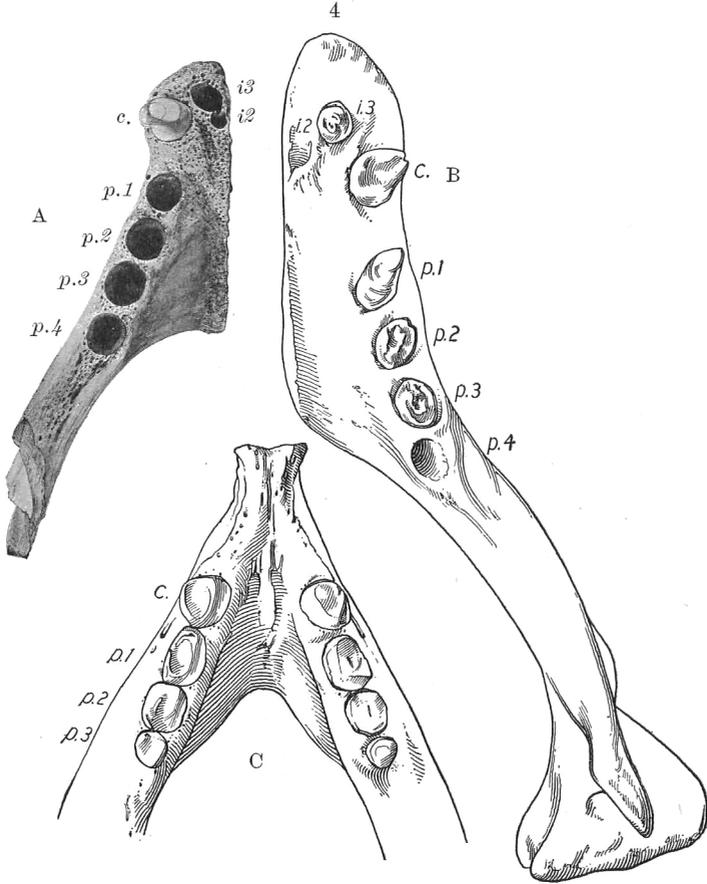


FIG. 4. A. Type of *Prorosmarus alleni*, lower jaw (left ramus) superior view. B. Type of *Alachtherium cretsii*, lower jaw (right ramus) superior view. (After Van Beneden.) C. Old male (cf. fig. 2) of *Odobenus rosmarus* lower jaw, superior view. All one-third natural size.

Description des Ossements Fossiles des Environs d'Anvers
(Ann. Mus. roy. d'His. nat. de Belgique, tome 1, 1877).

The mandible of *Alachtherium* (figs. 3, 4B), has been identified as positively *Odobænid*, while at the same time retaining certain characters of the *Otaries*. It resembles that of *Prorosmarus* in the dental formula, in the general form and arrangement of the teeth, in the persistent separation of the opposite rami of the jaw at the symphysis, in the long sloping chin and the slender coronoid. It differs from the mandible of *Prorosmarus* in being relatively longer, more slender, and shallower, and much more upwardly curved anteriorly, the long axis of the symphyseal face being almost at right angles to a line drawn through the front border of the coronoid. This implies a shorter, more upturned facial region. The distance from the last molar to the condyle is relatively greater and the bony "lip" of the jaw is much more produced anteriorly and lacks the eversion of the anterior margin. There is no narrowing of the upper border of the jaw immediately behind the canine, the inferior mental tubercle is much less marked, the posterior dental foramen is farther forward, and the jaw as a whole is much larger than that of *Prorosmarus*, the total length being about 37^{cm} from the incisive border to the condyle as against an estimated length of 21.5^{cm} in *Prorosmarus*. The molar series in *Alachtherium* measures about 9.5^{cm} as against 8^{cm} in *Prorosmarus*, that of the latter being thus relatively longer. The molars are also considerably more widely spaced and thus relatively smaller in *Alachtherium*, especially p.₁. In *Alachtherium* the lower canine seems to be in a fair way towards being taken over into the molariform series and the projection and narrowing of the bony "lip" beyond the canine may foreshadow the compressed rostrum of *Odobænus*.

Trichechodon huxleyi Lankester is known only from imperfect upper canine tusks which were very large but not equal to, and more recurved than, those of the existing *Odobænus*. These tusks are correlated by Van Beneden with the remains described by him as "*Trichechodon*" *koninckii*. The latter animal agrees with *Prorosmarus* in possessing four lower "molars," but, as represented in Van Beneden's plates, was extremely short-jawed, with very short mandibular symphysis, stout ramus and very large transversely expanded molars. In front of the molars was a still larger excavation or sinus which apparently opened externally and served to lodge the presumably immense upper canine.

All these forms strengthen the inference that the Walruses have been derived from some primitive member of the *Otariidæ*, probably during the middle Tertiary.