

THE GUMS OF THE PORPOISE PHOCENOIDES DALLI (TRUE)

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The remarkably small size of the teeth in the porpoises of the genus *Phocænoides* is well known. (Pl. 1.) True¹ pointed it out in his original description of *Phocæna dalli*, the first species to be discovered, and Andrews² later made it one of the diagnostic characters upon which he established *Phocænoides* as a genus distinct from *Phocæna*. Specimens collected in Alaska by Ernest P. Walker have brought to light the unexpected fact that the gums of *P. dalli* are so modified as to form a set of secondary gum teeth, alternating with and surrounding the true teeth, the extremities of which have come to lie at the bottoms of pits between the bases of the new structures, whose size and hardness is such that they are undoubtedly capable of functioning as efficient grasping organs. (Pls. 2-4.) No such condition has, to my knowledge, been described in any cetacean; and there is no known member of the order other than the two species of *Phocænoides* (the Alaskan *P. dalli* and the Japanese *P. truei*) in which the character of the dentition is such as to suggest that it might exist. Whether or not the structures which I am about to describe occur in *Phocænoides truei* as well as in the Alaskan species is a question which can not now be answered. Andrews says of the type (p. 41): "The teeth of this specimen are exceedingly small and in life project but slightly above the surrounding membrane." This remark seems hardly applicable to pit-ensconced teeth like those of *P. dalli*; but the gums of the animal may have been injured in skinning out the skull.

The skulls with gums in place obtained by Mr. Walker are Nos. 243599 and 251757, U.S.N.M., taken, respectively, at Wrangell on September 7, 1922, and at Sullivan Island, Lynn Canal, in November, 1926. There is also a nearly full term fetus (No. 251759) from

¹ Proc. U. S. Nat. Mus., vol. 8, p. 96, May 20, 1885.

² Bull. Amer. Mus. Nat. Hist., vol. 30, p. 31, May 16, 1911.

Sullivan Island, but unfortunately its head is injured and the mouth is not well preserved. The skulls, after partial fleshing, were treated with salt. They arrived at Washington in a slightly moist condition, and the gums, when soaked in fresh water and subsequently placed in alcohol, appear to have retained much if not all of their original structure.

The general appearance of the gums as viewed from the outer side is shown in Plate 2 (natural size). It will be seen that, along the entire course of the tooth row, except at the front, where some injury has been suffered, the gums stand up as a serrate-topped, raised mass, which, in the uninjured region extending backward from the middle of the row, entirely conceals the teeth. Probably in a fresh specimen with perfect gums no teeth would be visible anywhere in the series.

Photographs of segments containing four teeth are shown, five times natural size, in Plates 3 and 4. The gross structure of the gums and the relations of the true teeth to the new prehensile apparatus may be seen with special clearness in the series of four mandibular teeth represented in Plate 3. In the outer view (*a*) the gum has been injured at one point so that the flat crown of the second tooth from the left is visible at the bottom of the angular cleft between the bases of the first and second complete gum teeth. All the other true teeth are hidden in this view as well as in that from the inner side of the jaw (*b*). In the coronal aspect (*a*) the summits of the four true teeth are seen at the bottoms of their pits, with the four alternating gum teeth occupying the areas between them. In Plate 4 we have a segment of the rostrum including four teeth and extending inward nearly to the median line of the palate. It is shown in palatal aspect (*a*) and vertical section (*b*). The gum teeth are foreshortened and flattened by the camera in the palatal view, but their height is well brought out in the vertical section. It will be noted that the entire surface of the palate is coarsely and irregularly wrinkled, the general direction of the broad ridges and narrow intervening furrows tending to be parallel with the tooth row; also that the profile of these secondary ridges, when viewed in cross section, resembles the corresponding profile of the functional gum teeth. The gum surface as seen on the palate (pl. 4*a*) and on the inner side of the mandible (pl. 3*b*) is noticeably papillose. In cross section under this low magnification the papillæ appear as conical outgrowths from the substance of the ridges.

Microscopical preparations, made by staining and sectioning a piece of one of the gum teeth at the Anatomical Laboratory of the Johns Hopkins Medical School,³ show that the elevations are dermal

³ I owe this series of slides to the kindness of Dr. George B. Wislocki.

at base but that each is capped by a conspicuous layer of greatly thickened epidermis. At the base of each elevation may be seen a thickened mass of corium from which arises a group of papillæ (about 0.125 mm. in width) extending upward through the first layer of the epidermis. This layer (about 1.05 mm. in thickness), whose cells contain nuclei which tend to be highly refractive, appears to be the *stratum germinativum*. It is followed by a second layer (also about 1 mm. in thickness) in which the nuclei are dark, seemingly the *stratum granulosum*. At the peripheral surface it is elevated into the papillæ which cover the entire surface of the gums. Each superficial papilla is subtended by a papilla of the corium; and in sections which have been cut at appropriate levels the *stratum granulosum* can be seen to be traversed by a narrow line of crowded nuclei extending from the tip of the corial papilla outward into the substance of the terminal papilla. In some preparations the surface of the terminal papillæ is covered by a thin layer of flattened cells which may represent the *stratum corneum*, but which has, in most instances, apparently been stripped away in course of preparation. The superficial appearance of this outermost layer is shown in the upper left hand portion of Figure *a* on Plate 4. Here it may be seen to cover most of the underlying papillæ completely. Occasionally it is pierced by a minute aperture over the tip of a papilla, and occasionally an entire papilla or a small group is entirely laid bare.

The general conditions which I have just described, both macroscopic and microscopic, seem to be not essentially different from those which Tullberg figured as occurring at early stages of the development of the baleen plates in *Sibbaldus*.⁴ Comparing Tullberg's Plate 4 with my Plate 4 the general resemblance in gross structure is at once evident, allowance being made for the much more highly specialized condition present in *Sibbaldus*. The true teeth in the young baleen whale have disappeared. The gum teeth are compressed along the axis of the jaw; their bases have spread inward to occupy a much greater area of the palate; they have increased in height. The papillæ on the palate have become elongated and filamentous. Otherwise there is no important change. The microscopic structure in *Phocænoides* could be fairly well represented by Tullberg's Plate 5, Figure 23, if the drawing were reduced to about one-third of its present height (the width remaining unaltered), the papillæ were represented as single instead of in pairs, the terminal papillæ were cut off at the level of the lower letter *c*, and a dividing line between the *stratum germinativum* and *stratum granulosum* were indicated.

⁴ Nova Acta Reg. Soc. Sci. Upsal., ser. 3, vol. 11, pl. 4, figs. 19-20, and pl. 5, fig. 23. 1883.

These resemblances are so important that we are probably justified in regarding the gingival and dental structures of *Phocænoides* as representing anatomical stages closely parallel to those through which the corresponding parts in the toothed ancestors of the Mysticeti must have passed.

EXPLANATION OF PLATES

PLATE 1

(Both figures about $\frac{1}{2}$ natural size)

- a. Teeth of *Phocæna phocæna* from St. George Island, Bearing Sea. No. 218737, U.S.N.M.
- b. Teeth of *Phocænoides dalli* from Sullivan Island, Lynn Canal, Alaska. No. 251757, U.S.N.M. Gums partly removed.

PLATE 2

(Natural size)

- Lateral view of rostrum and mandible of *Phocænoides dalli* showing gum teeth. (No. 251758, U.S.N.M., Sullivan Island, Lynn Canal, Alaska)

PLATE 3

(All figures $\times 5$)

Part of mandibular toothrow of *Phocænoides dalli* with gums in place. (No. 243599, U.S.N.M., Wrangell, Alaska)

- a. Outer aspect.
- b. Inner aspect.
- c. Coronal aspect.

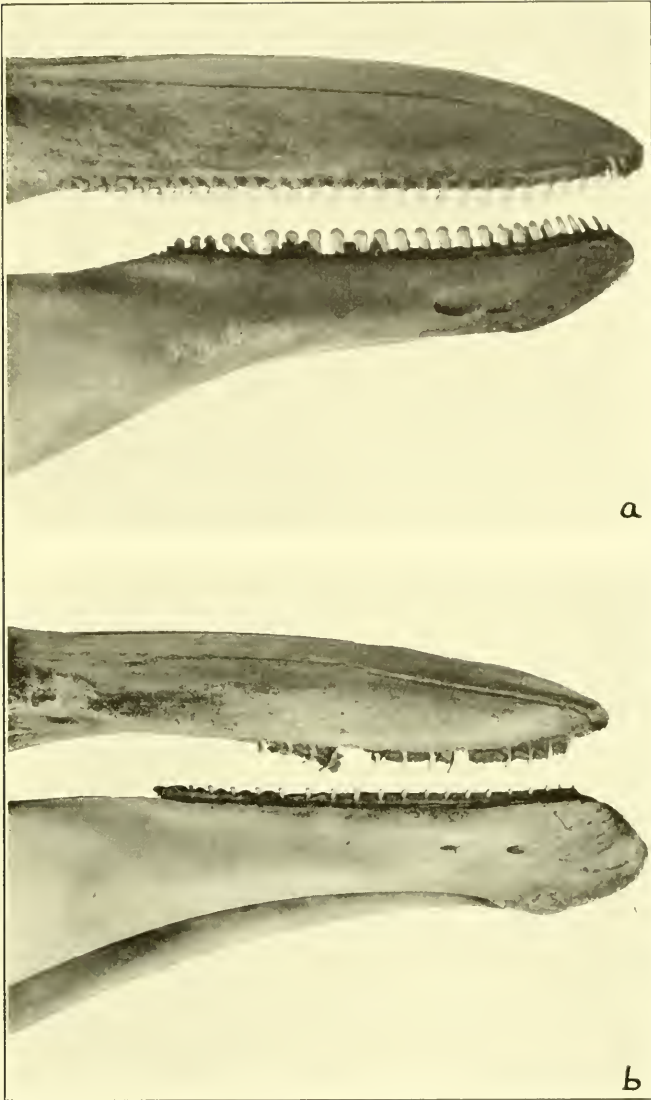
PLATE 4

(Both figures $\times 5$)

Part of rostrum of *Phocænoides dalli* with gums in place. (No. 243599, U.S.N.M., Wrangell, Alaska)

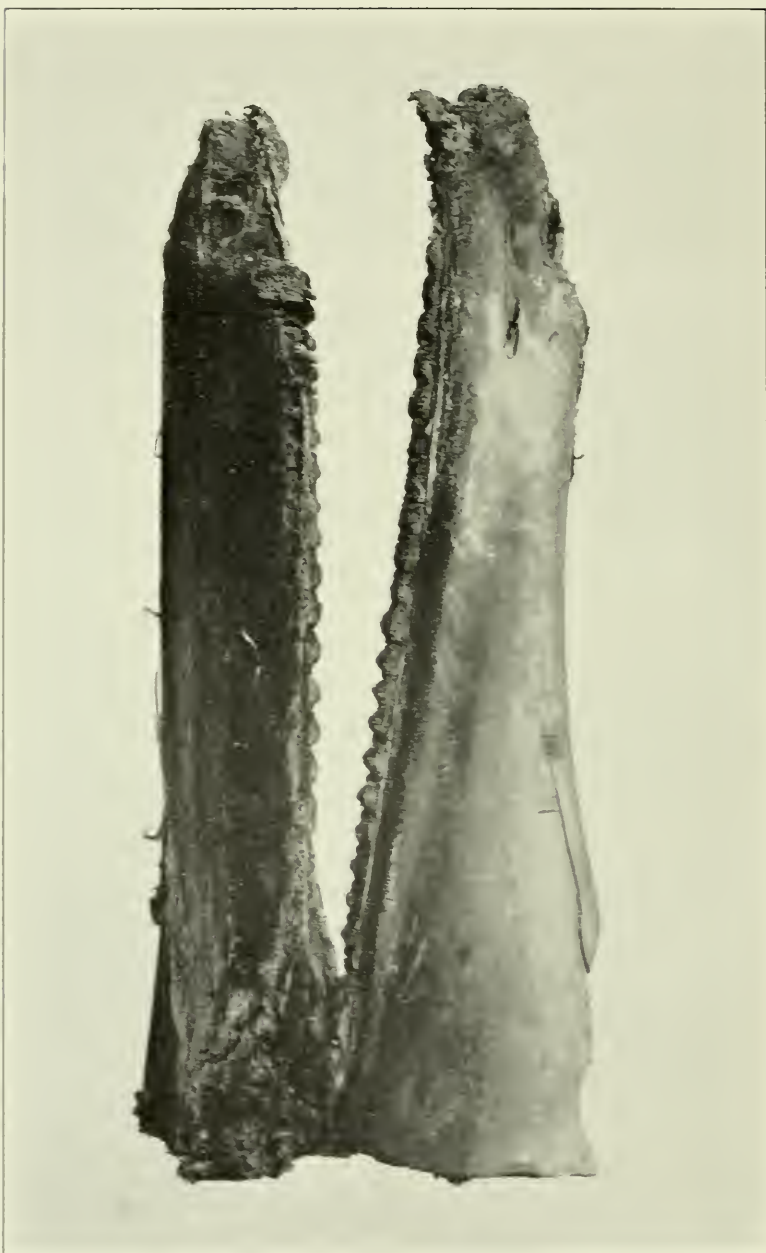
- a. Palatal aspect.
- b. Vertical aspect.





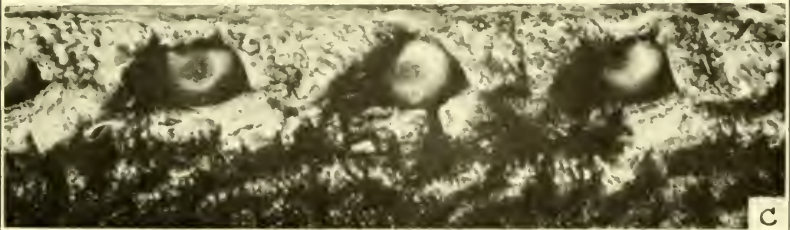
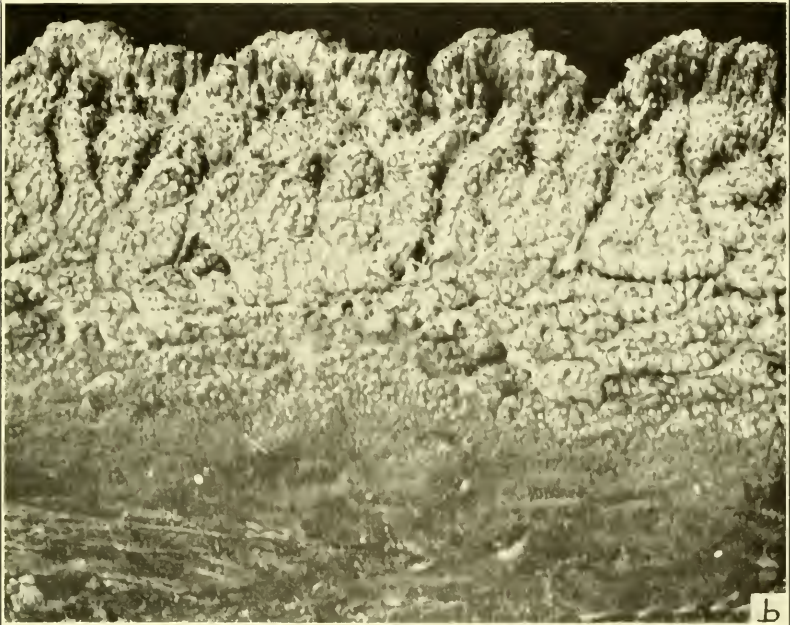
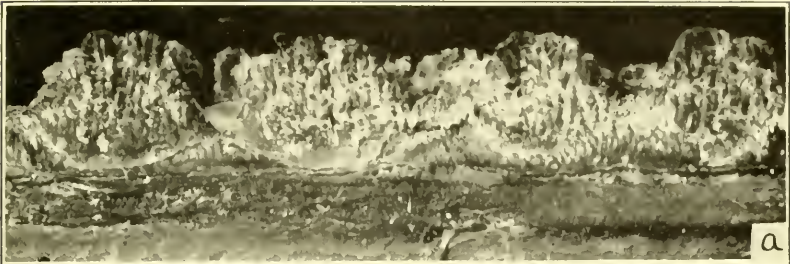
TEETH OF *a* PHOCAENA AND *b* PHOCOENOIDES

FOR EXPLANATION OF PLATE SEE PAGE 4



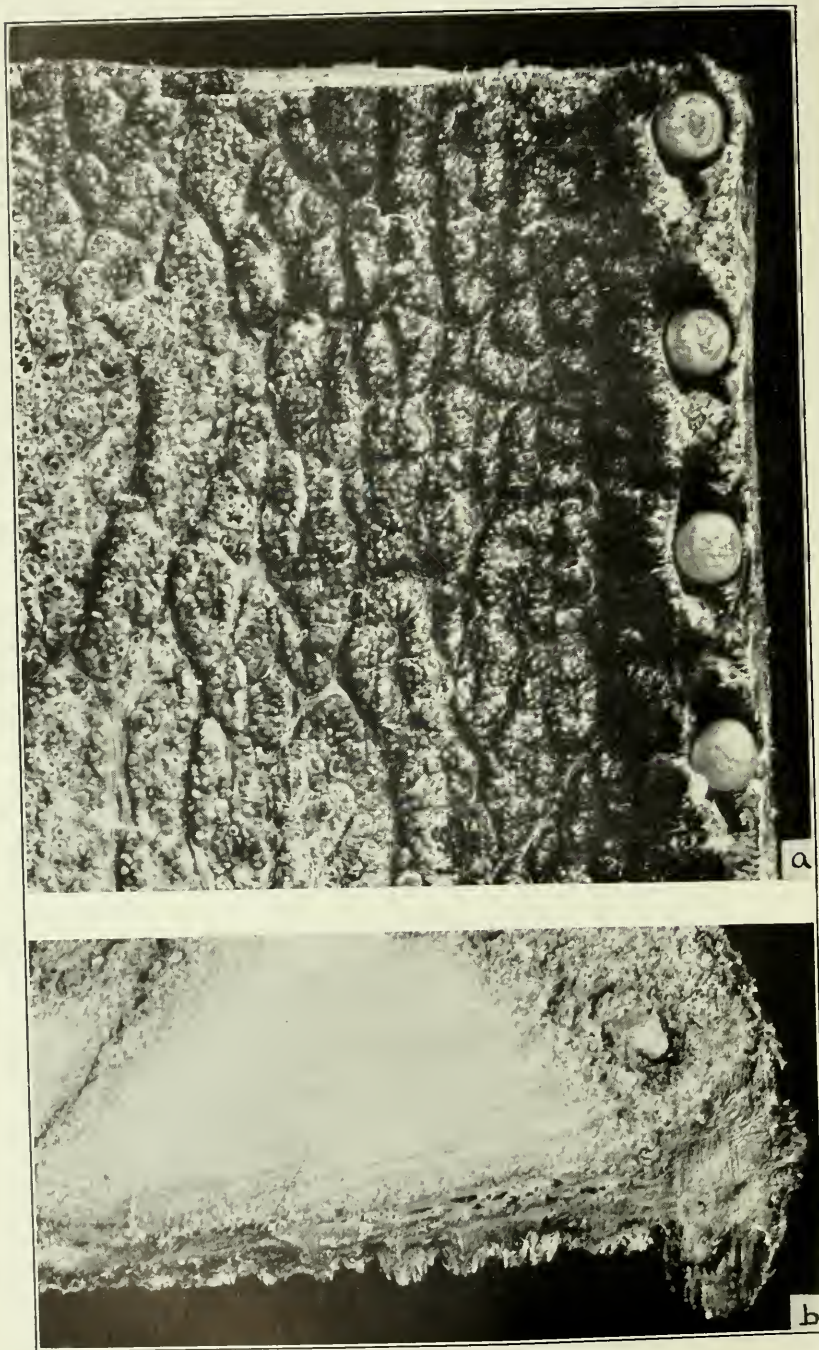
JAWS OF PHOCOENOIDES

FOR EXPLANATION OF PLATE SEE PAGE 4



GUMS OF PHOCOENOIDES, LOWER JAW

FOR EXPLANATION OF PLATE SEE PAGE 4



GUMS OF PHOCOENOIDES, UPPER JAW

FOR EXPLANATION OF PLATE SEE PAGE 4