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REMARKS ON THE TYPE OF THE FOSSIL
CETACEAN AGOROPHIUS
PYGMÆUS (Müller)

BY

FREDERICK W. TRUE



No. 1694

CITY OF WASHINGTON
PUBLISHED BY THE SMITHSONIAN INSTITUTION

1907



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REMARKS ON THE TYPE OF THE FOSSIL CETACEAN AGOROPHIUS PYGMÆUS (Müller).

BY FREDERICK W. TRUE.
(With One Plate.¹)

Somewhat more than fifty years ago the Smithsonian Institution, then recently founded, undertook the publication of a number of memoirs by Prof. Louis Agassiz, and prepared some lithographic plates to accompany them. Before the work had proceeded very far, Professor Agassiz made other arrangements for the publication of his writings and the plates were never issued. One of these unpublished plates represents the type-specimen of a very remarkable species of fossil cetacean, now known as *Agorophius pygmæus* (Müller), and on account of circumstances which are detailed below it has been thought desirable to issue it, with a brief explanation as to its importance.

In 1847 Prof. F. S. Holmes and Prof. L. R. Gibbes of Charleston, South Carolina, obtained from the Eocene marl of Ashley river at Greer's Landing, about 10 miles from the city, an imperfect cetacean skull.² The specimen was placed in the hands of Mr. M. Tuomey, Geologist of the State of South Carolina, who published an account of it, with two figures, in the Proceedings of the Philadelphia Academy of Natural Sciences,³ and also in the Journal of the Academy,⁴ referring it to the genus *Zeuglodon* (or *Basilosaurus*).

These publications attracted the attention of Prof. J. Müller of Berlin, Germany, who was at that time engaged in the study of *Zeuglodon* (or *Basilosaurus*), and an account of the specimen, with a copy of Tuomey's figures, appeared in 1849, in his work on that genus, under the name of *Zeuglodon pygmæus*.⁵

¹The plate bears the legend "*Phocodon holmesii* Agass.", a manuscript name.

²See Tuomey's Report on Geology of South Carolina, 1848, p. 166.

³Proc. Acad. Nat. Sci. Phila., 3, 1847, pp. 151-153.

⁴Jour. Acad. Nat. Sci. Phila., 1, 1847, pp. 16-17.

⁵Zeuglodonten von Nordamerika, 1849, p. 29, pl. 23, figs. 1, 2.

Not long afterward the specimen came to the attention of Prof. L. Agassiz, who arranged to have the plate prepared which accompanies this notice.¹ The name "*Phocodon holmesii* Agass." appears to have been placed on the plate when first made. So far as I am aware, it did not appear in print elsewhere until mentioned by Leidy in a list of synonyms of "*Squalodon pygmæus*" in 1869.²

In 1867 Cope referred the specimen to the genus *Dorudon* Gibbes (1845), an ally of *Basilosaurus*,³ but in 1868 concluded that it did not belong to the former,⁴ remarking that it was "not only generically distinct from *Basilosaurus*, but from *Doryodon* also." About this time Leidy obtained a loan of the specimen from Professor Holmes, and upon examination of it decided to refer it to *Squalodon*, under the name of *Squalodon pygmæus*. He published an excellent description and two figures of it in his work on the Extinct Mammalian Fauna of Dakota and Nebraska, already cited.⁵

Finally, in 1895, Cope, confirming his earlier opinion that the specimen represented a distinct genus, gave it the name of *Agorophius*,⁶ remarking at the same time: "The form of the skull in this genus approaches distinctly that of *Cetotherium* of the Balænidæ, and the permanent loss of the teeth would probably render it necessary to refer it to a Mystacocete."

This idea did not originate with Cope. Paul Gervais wrote in 1871: "It is in connection with the rorquals (*a la suite des rorquals*), and not among the Squalodons, that it is necessary to class *Squalodon pygmæus*. The form of this skull is quite similar to that of the rorquals, and it differs, on the contrary, from that which characterizes the Squalodons, if one take as an example of the latter the *Squalodon* of Barie, in the museum of Lyons."⁷

As this suggestion is one of great moment, the specimen has a twofold interest and importance—first as representing a very distinct genus, and, second, as representing a possible direct ancestor of the whalebone whales.

In view of the excellent character of the figures published by Leidy, it would at first appear that no more were necessary, but a number of considerations led me to recommend that the earlier plate by Professor Agassiz be now published. Most important of all is the fact that the unique specimen which it portrays appears to have been lost. So far as I have been able to ascertain, it

¹"*Phocodon*, Agassiz. Prof. A. will soon publish a complete memoir on this genus found in the United States, in which will be given the result of his personal observations drawn from large collections of remains." (Note by Wyman in Amer. Jour. Sci., 10, 1850, p. 230, foot-note.)

²Jour. Acad. Nat. Sci. Phila., (2), 7, 1869, p. 420.

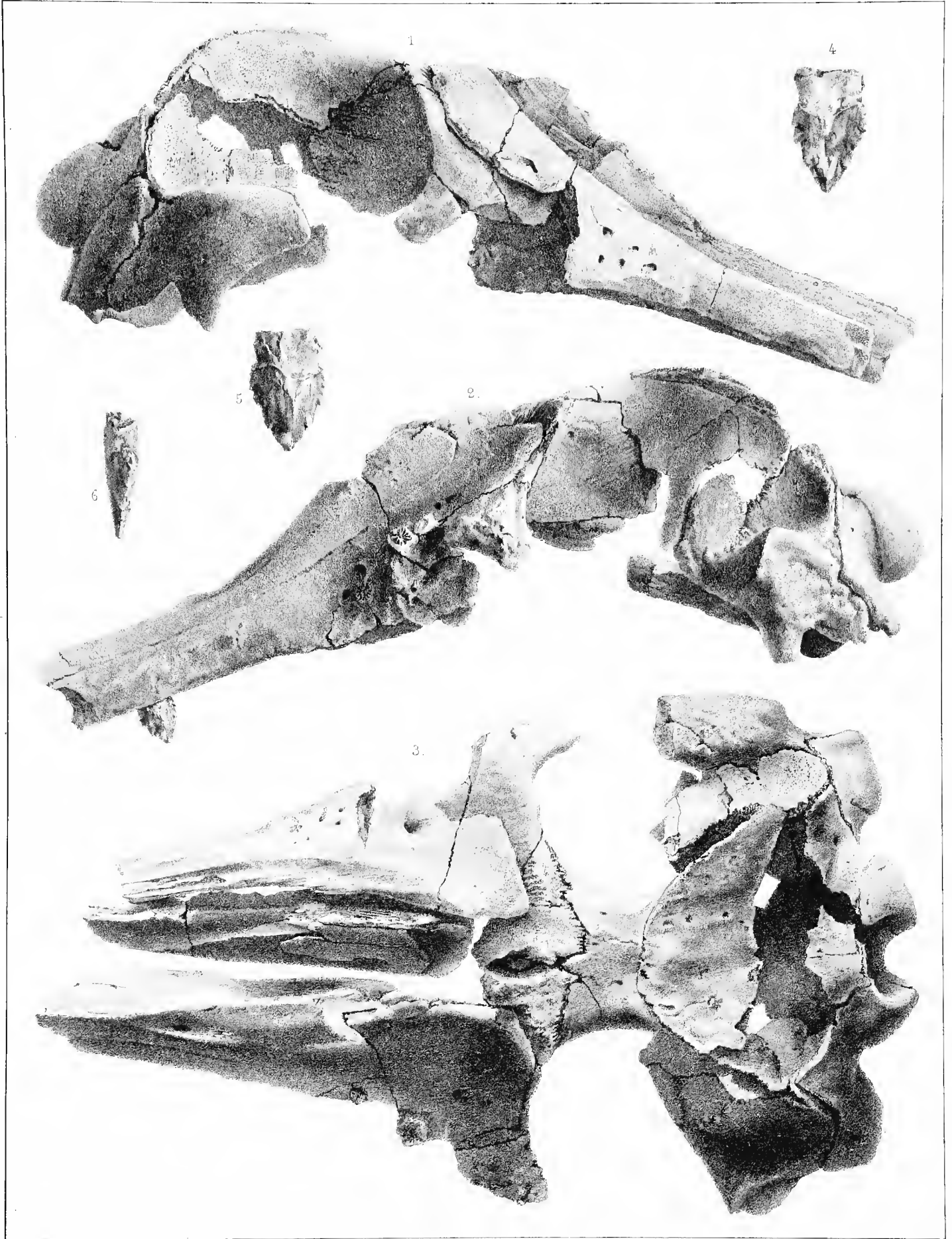
³Proc. Acad. Nat. Sci. Phila., 1867, p. 155. Cope altered the spelling to *Doryodon*.

⁴*Ibid.*, 1868, p. 186.

⁵Jour. Acad. Nat. Sci. Phila., (2), 7, 1869, p. 420, pl. 29, figs. 7, 8.

⁶Proc. Amer. Philos. Soc., 34, 1895, p. 139.

⁷Nouv. Archiv. Mus. Hist. Nat. Paris, 7, 1871, p. 138.



A. Sowerby on stone from nat. Boston.

Tappan & Bradford's lith.

PHOCODON HOLMESII Agass.

has not been seen by any zoölogist since Leidy examined it in 1869. Leidy's statement at that date¹ was as follows: "Professor Holmes, to whom the specimen now belongs, has recently submitted it to my examination." The Holmes collection was purchased by the American Museum of Natural History in 1873, and one would naturally expect to find the skull of *Agorophius* in that institution, but on writing to Dr. H. C. Bumpus, director, I was disappointed to learn that it could not be found. Thinking that Leidy might have deposited it in the Philadelphia Academy, I wrote to Prof. J. Percy Moore regarding it, but was informed that it was not in the museum of that institution.

A comparison of Leidy's figures with those in the plate now published shows, first, that some fragments of the skull had been lost between 1850 and 1869, and, second, that the single tooth originally remaining in the skull had also disappeared. The principal pieces of the skull lost were a fragment from the proximal end of the right maxilla and a fragment from the distal end of the post-orbital process of the left frontal. In Leidy's side view of the skull the left premaxilla was transposed to the right side. He did not figure the left side of the skull.

The single tooth, already mentioned, which is so well shown in figs. 2, 4, 5, and 6 of the plate published herewith, is not shown at all in Leidy's figures, and that author remarked that it had been lost.

The original figures of the upper surface and right side, published by Tuomey in 1847,² are crude but apparently fairly accurate. The maxillæ as there shown are complete proximally, indicating that portions of the skull at this point were lost at some subsequent date. The form of the single tooth is substantially that of the later and more carefully drawn figures. Tuomey states that a portion of the left upper maxilla containing one tooth was found by F. S. Holmes in the Eocene beds of Ashley River, about 10 miles from Charleston, and that Prof. Lewis R. Gibbes afterward visited the same spot and found the remainder of the skull. He gives the following dimensions: Length (incomplete), 14½ in.; greatest breadth, 7½ in.; height, 5½ in.; length of enameled portion of tooth, ⅔ in.

In the preceding paragraphs I have mentioned briefly some of the views that have been expressed by zoölogists regarding the relationships of *Agorophius*. It may be desirable to consider this subject a little more in detail. As regards the opinion that *Agorophius* is a near ally or possibly a direct ancestor of the rorquals, it appears to me that there is little probability of its correctness.

¹Jour. Acad. Nat. Sci. Phila., (2), 7, 1869, p. 421.

²Proc. Acad. Nat. Sci. Phila., 3, 1847, pp. 151-153. Also in Amer. Jour. of Sci., (2), 4, 1847, pp. 283-5, with copies of the original figures.

While it is true that both the rorquals and *Agorophius* have large and wide temporal fossæ and a compressed vertex, these are, I think, only superficial resemblances. In all existing rorquals (*Balænoptera*, *Megaptera* and the aberrant *Rhachianectes*) the orbital processes of the frontals are pushed backward toward the brain-case, and are scarcely covered at all anteriorly by the maxillæ. In *Agorophius* the frontals are almost entirely covered by the maxillæ and a wide space intervenes between them and the brain-case. In *Agorophius* again the median constriction at the vertex is formed by the parietals, while in the rorquals it is formed, superiorly at least, by the frontals, which meet the supra-occipital and exclude the parietals from the top of the skull.

In the Tertiary rorquals, *Heterocetus*, *Mesocetus*, *Idiocetus*, *Aulocetus*, etc., in which the parietals appear on the vertex for some distance, the relations of the frontals and maxillæ are not substantially different from those found in existing genera, and show no closer approximation, so far as I can see, to the relations of these bones in *Agorophius*. The ancestor of the rorquals and other whalebone whales was, in my opinion, a very different form from *Agorophius*, and is quite unknown.

The association of *Agorophius* with *Squalodon* has much to commend it, and suggests itself especially on account of the form of the teeth. That it is, however, a close ally of typical species of *Squalodon* appears to me improbable. In such forms as *S. bariensis*, *servatus*, etc., the cranium exhibits the antero-posterior compression at the middle of the cranium and the overlapping of the maxillary, frontal, and parietal bones in as marked degree as in existing delphinoids, indicating an advanced development in this direction. In *Agorophius* the parietals separate the frontals from the supraoccipital by a wide interval on the superior surface of the skull, and the postero-external border of the frontal is somewhat exposed, impressing on the skull a very different appearance from that of the typical *Squalodons*. There is one species assigned to *Squalodon*, however, which presents a much closer resemblance to *Agorophius*. This is *S. ehrlichii* Van Beneden.¹ It is but little larger than *Agorophius*, or perhaps about equal in size. Like *Agorophius*, but unlike other species of *Squalodon*, it has a broad rostrum. The figures of *S. ehrlichii* published by Van Beneden² and by Brandt³ are very unsatisfactory, indicating that the specimens are very imperfect and in exceedingly poor condition. Most unfortunately of all, the region of the vertex is especially imperfect, so that there is no possi-

¹ Mem. Acad. Belg., 35, 1869, p. 72, pls. 2-3.

² Loc. cit.

³ Mem. Acad. Sci., St. Petersburg, 20, 1873, pl. 31; 21, 1874, pl. 4, figs. 12-17.

bility of deciding whether it is composed of the frontal joined to the supraoccipital, as in typical *Squalodon*, or whether it is formed chiefly by the parietals, as in *Agorophius*. The frontals appear to extend outward and backward over the temporal fossæ as in typical *Squalodon* and the delphinoids. In Brandt's figures of *S. ehrlichii* the brain-case is much shorter relatively than in *Agorophius*, but this may be due to the fact that in restoring the skull not sufficient space was allowed for missing parts at the middle of the skull. In its size and general conformation, in the elevation of the brain-case above the rostrum, in the breadth of the rostrum, and in the height of the intermaxillæ, *S. ehrlichii* strongly resembles *Agorophius*. On the whole, it appears to hold an intermediate position between typical *Squalodon* and *Agorophius*, and is certainly not to be closely associated with the former.

The large extension of the parietals on the superior surface of the skull in *Agorophius* indicates that it is a primitive form and it is not unlikely that some such form was the ancestor of both *S. ehrlichii* and typical *Squalodon*. That *Agorophius* itself is in the direct line is improbable on account of the form of the teeth. The single tooth which was originally found in the skull of *Agorophius* is more specialized than those of the *Squalodons*. As indicated by the figures in the accompanying plate, the internal and external surfaces were about equally developed, as were also the anterior and posterior cusps. Only a small portion of the roots is shown in the figures, but the tooth appears to have been two-rooted. There is no indication of a third root, such as is found in some specimens of *Squalodon*.

Other genera beside *Squalodon* which have been assigned to the family Squalodontidæ are *Prosqualodon*, *Neosqualodon*, *Proterocetus*, *Phococetus*, *Graphiodon* and *Ceterhinops*.

Of these *Proterocetus* is based on a portion of a mandible of extraordinary minuteness, while *Phococetus* and *Graphiodon* are based on single teeth. On account of the character of the material no comparisons of the importance can be made with *Agorophius*. *Prosqualodon*, based on a very well-preserved skull, shows a close affinity to *Squalodon*, especially in the backward extension of the frontals and the form of the vertex, and cannot be regarded as a close ally of *Agorophius*. *Ceterhinops*, based on a fragment of a skull from the region of the anterior nares, resembles *Squalodon* so closely, especially *S. servatus*, that there appears to be no sufficient reason for separating it from the latter genus. The genus *Neosqualodon* is based on the rostrum of a skull, broken off at about the line of the anterior nares and the nearly complete right ramus of a mandible. The skull was probably a little smaller than that of *Agorophius*. A number of

beautifully-preserved teeth are *in situ* in both upper and lower jaws. As nothing remains of the posterior portion of the skull, no opinion can be formed regarding the characters of the parietals, the form of the temporal fossæ, etc. Only the anterior portion of the frontals is preserved. This portion appears to resemble the same part in *Squalodon* and the ordinary delphinoids, rather than in *Agorophius*. The premaxillæ are broader than in *Squalodon* and nearly as flat. They are not thickened and bent upward posteriorly, as in *Agorophius*. The crowns of the upper teeth are much lower and broader than that of the single tooth originally found with the skull of *Agorophius*, and the distal ones have but one cusp anteriorly, while that of *Agorophius* has two or perhaps three. Altogether it seems probable that *Neosqualodon* bears no close relationship to *Agorophius*.

