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## ON THE ABSENCE OF GILL RAKERS IN SPECIMENS OF THE BASKING SHARK, *CETORHINUS MAXIMUS* (GUNNER)

by

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In the majority of the papers dealing more or less extensively with *Cetorhinus maximus* the gill rakers (fanunculi) are correctly described and regarded as specifically characteristic, whilst in a number of other papers, e.g., de Blainville (1812), Vrolik (1826), and Tchang Si (1934) the gill rakers are not mentioned. This does not necessarily indicate that the specimens examined by the cited authors did not possess gill rakers, probably no definite search was made concerning the presence or absence of these parts.

From 1821 till 1952 there stranded in the Netherlands or were brought ashore by fishermen 21 specimens of *Cetorhinus maximus*; of nine of these it was stated that they had gill rakers, four of these specimens proved to be without gill rakers, whilst of the other specimens no notes are given concerning these parts; the last named specimens will not be further dealt with in the present paper.

During the years 1950 till 1952 special attention was paid to the condition of the gill rakers in the specimens of *Cetorhinus maximus* that became available. The following data could be obtained.

At Oostkapelle, island of Walcheren, province Zeeland, on April 11, 1950, Mr. P. J. van der Feen (Amsterdam) saw a male specimen with gill rakers; length 5.50 m. At Domburg, island of Walcheren, on October 23, 1950, he found a male specimen without gill rakers; length 3.37 m. Material of these two specimens has been preserved in the collections of the Zoological Museum at Amsterdam.

At the beach of the island of Texel, province North Holland, on September 5, 1951, Mr. I. Kristensen (Den Helder) found a female specimen with gill rakers; length 3.64 m.

On October 19, 1951, van Deinse and Adriani examined a male specimen, caught at Dogger Bank and brought ashore at IJmuiden; length 3.60 m. The specimen had gill rakers, material of which has been preserved in the Gymnasium Erasmianum at Rotterdam.

On November 11, 1951, van Deinse examined a specimen of unknown sex, obtained in the North Sea, 30 miles to the Northwest of Scheveningen, brought ashore at Scheveningen; length 5.30 m. This specimen did not have gill rakers; some material has been preserved in the Gymnasium Erasmianum at Rotterdam.

Off IJmuiden, at about 45 km from the shore, on November 24, 1951, a male specimen without gill rakers, length 6.20 m, was caught. The specimen was examined by van Deinse and Dr. M. Boeseman; some material has been preserved in the Rijksmuseum van Natuurlijke Historie at Leiden.

In the North Sea, at about 45 miles Northwest of Scheveningen, on October 20, 1952, a male specimen without gill rakers, length 5.50 m, was caught. The specimen was examined by van Deinse and Dr. M. Boeseman; some material has been preserved in the Rijksmuseum van Natuurlijke Historie at Leiden and in the Gymnasium Erasmianum at Rotterdam.

These data may be tabulated as follows:

Nr.	Date	Locality	Sex	Length	Gill rakers
1	April 11, 1950	Oostkapelle	♂	5.50 m	present
2	October 23, 1950	Domburg	♂	3.37 m	absent
3	September 5, 1951	Texel	♀	3.64 m	present
4	October 19, 1951	North Sea	♂	3.60 m	present
5	November 11, 1951	North Sea	?	5.30 m	absent
6	November 24, 1951	North Sea	♂	6.20 m	absent
7	October 20, 1952	North Sea	♂	5.50 m	absent

The data given above sufficiently prove that besides specimens of *Cetorhinus maximus* with fanunculi there are specimens in which these parts are completely lacking. The general opinion is that *Cetorhinus maximus* uses the fanunculi to sieve the plankton out of the sea water. Moreover it is known that the species sometimes also eats fish (letter from Prof. L. F. de Beaufort, January 5, 1952, to van Deinse).

Parker and Matthews (1950) dissected in May, 1947, about ten specimens of *Cetorhinus maximus* in the Hebrides; in all of these they found fanunculi on the gill arches and partly digested plankton in the stomach. Boeseman, van Deinse, and Adriani examined the stomach of the 1952 specimen without fanunculi, they could state that here too it was filled with partly digested plankton, whilst remains of fish were certainly not present. Hence it seems evident that the gill rakers are not an indispensable factor in the feeding

mechanism of *Cetorhinus maximus*. The animal does not appear to need the gill rakers for accumulating plankton; if this were true no remains of plankton would have been observed in the stomach of the last named specimen.

Specimens of *Cetorhinus maximus* without gill rakers present such a striking difference from those that have gill rakers that one is inclined to regard the former as a special form of the species for which the name *infanuncula* nova forma might be chosen. As there are, however, no other characters indicating a diversity of forms within the species, the specimens without gill rakers might be regarded as an aberration, which, however, seems to be of by no means extremely rare occurrence.

On the other hand the specimens without gill rakers might indicate that, periodically or at irregular times, the gill rakers are shed. This might occur at a certain season of the year, or at a certain age of the animals. Then the absence of gill rakers would be temporary only, to be followed by a condition in which these parts again came to full development. The fanunculi are considered homologous with the teeth of the placoid scales and therefore with the set of teeth of the jaws. It is known that sharks shed their teeth, so it remains possible that the fanunculi may shed too.

If the absence of gill rakers is brought about by shedding it is a curious fact that no specimens have been observed in which a partial shedding of these parts had taken place. Moreover no specimens have become known in which a new set of gill rakers in course of development was to be seen.

In the off shore waters of the Netherlands *Cetorhinus maximus* is not known to occur in the months January, February, March, July, and August; in the other months of the year specimens have been observed, most frequently in October and November. The specimens without gill rakers were found in these two months only, so that one might be inclined to regard this time of the year as the period of the shedding of the fanunculi. But another specimen, obtained in this time of the year, was in possession of a complete set of these parts, so that the evidence for a fixed time for the shedding of the fanunculi still is extremely scanty.

A far larger material than at present is available is needed for an acceptable explanation of the absence of gill rakers. The principle aim of the present paper is to draw attention to this abnormal condition, so that further observations may take place leading to a gradual solution of the questions here referred to.

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## EXPLANATION OF THE PLATES

## Plate XVII

*Cetorhinus maximus* (Gunner); male, 3.60 m, Dogger Bank, North Sea, October 19, 1951 (no. 4 of the table).

Upper left, 3 gill arches with gill rakers, front view,  $\times \frac{1}{6}$ ; lower left, 3 gill arches with gill rakers, back view,  $\times \frac{1}{6}$ ; upper right, throat and gill rakers,  $\times \frac{3}{8}$ ; lower right, isolated gill rakers,  $\times \frac{7}{8}$ .

Photographs C. Leyenaar, Rotterdam.

## Plate XVIII

*Cetorhinus maximus* (Gunner).

Left, male, 3.60 m, Dogger Bank, North Sea, October 19, 1951 (no. 4 of the table), gill arch with gill rakers,  $\times \frac{1}{2}$ .

Right, sex unknown, 5.30 m, North Sea, 30 miles NW of Scheveningen, November 11, 1951 (no. 5 of the table), gill arch without gill rakers,  $\times \frac{1}{3}$

Photographs C. Leyenaar, Rotterdam.

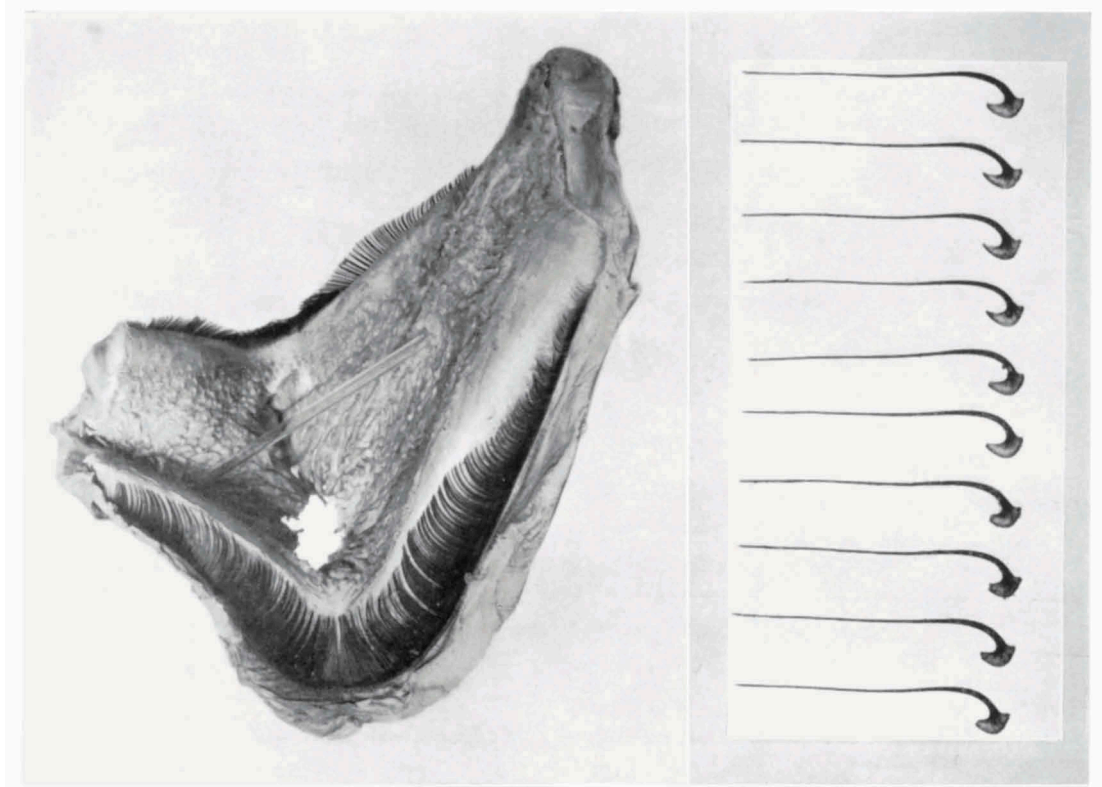
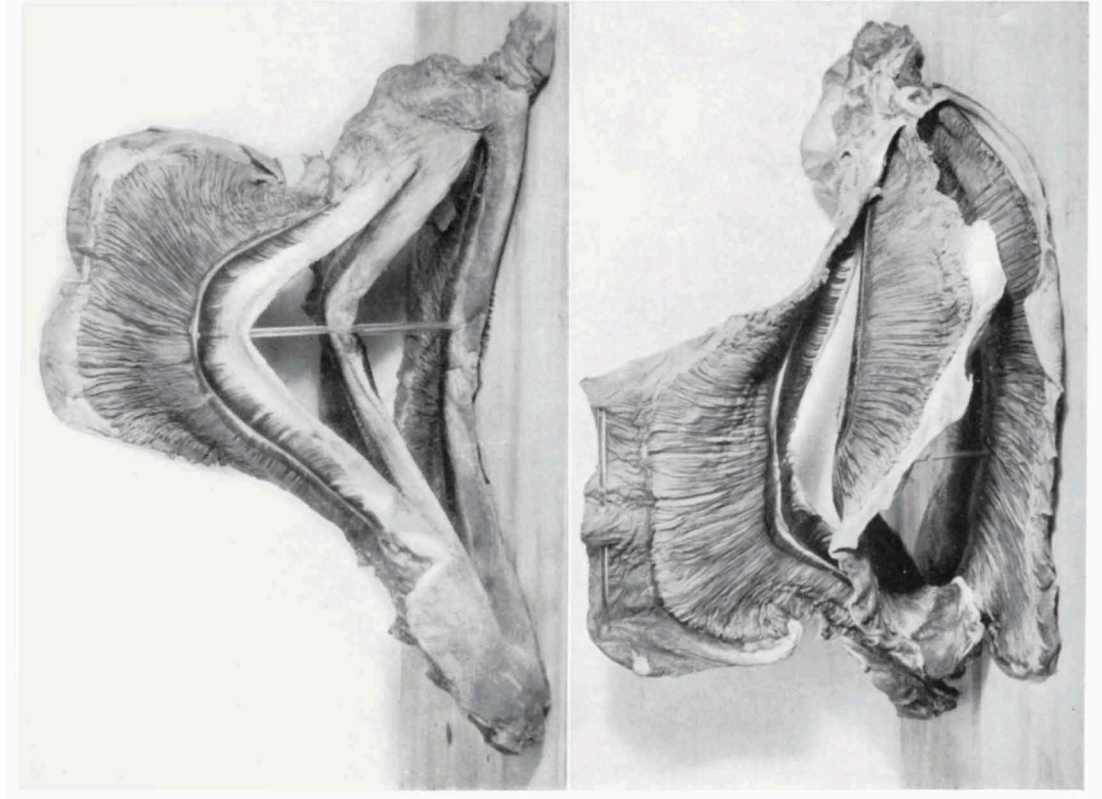
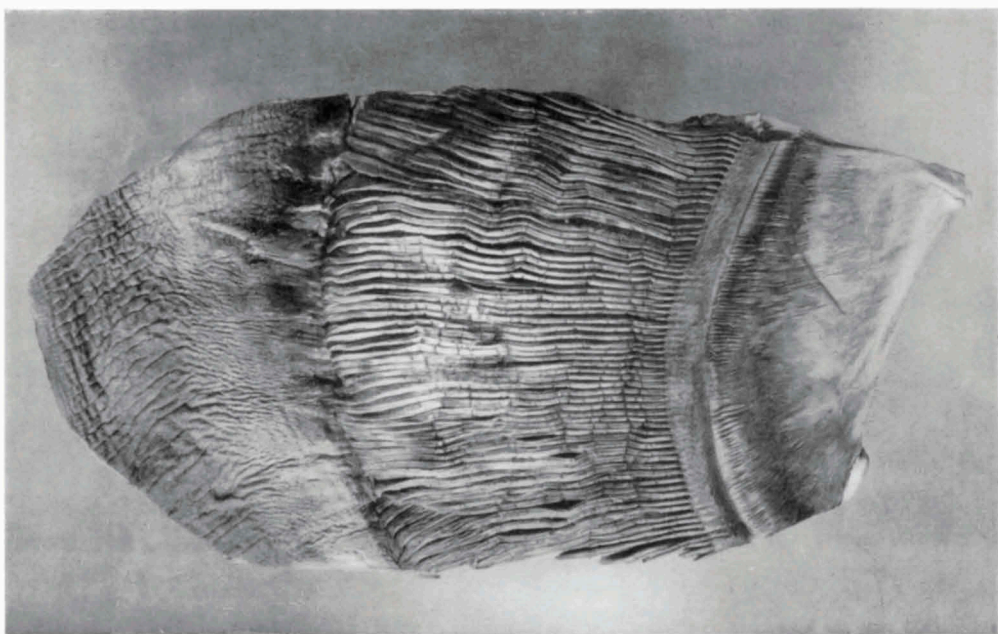


PLATE XVIII



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