

**PATHOLOGY**

**A NEW CASE OF HEPATIC CIRRHOSIS IN THE BLUE WHALE  
*BALAENOPTERA MUSCULUS* (L.)<sup>1)</sup>**

BY

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(Communicated by Prof. M. W. WOERDEMAN at the meeting of March 20, 1954)

**I. Introduction**

Referring to our paper on hepatic cirrhosis in the blue whale *Balaenoptera musculus* (L.) (STOLK, 1953), we now describe a new case of this disease in the same species.

The material was collected during the expedition 1952/1953 of the Dutch whaler "Willem Barendsz" and was sent to us by Mr W. L. VAN UTRECHT (Amsterdam).

The cirrhotic liver was fixed in Bouin's solution and was embedded in paraffin. The sections (4-6  $\mu$ ) were stained with hematoxylin and eosin, hematoxylin and phloxin, and moreover according to the Van Gieson method and the azan method.

**II. Description**

The animal, in which we found the hepatic cirrhosis, was an adult female (length 80 English feet). Macroscopically the liver showed an irregular surface with more or less deep grooves, lobulations and some superficial necrotic areas (figs. 1 and 2). Also on section, lightly coloured necrotic areas were distinctly visible embedded in the liver tissue (fig. 3). In these necrotic areas as well as in the liver tissue there were cysts of varying size. On section it seemed that no definite lobulation whatever could be distinguished.

Microscopic examination revealed an extended growth and increase of connective tissue consisting of a finely diffused network of waving collagenous fibers and fibroblasts. The connective tissue was present throughout the whole liver and had caused considerable destruction of the organ.

The structure of the connective tissue was dense or less dense. In the first case the tissue consisted of waving collagenous fibers varying much in diameter and crossing one another in various directions and at different angles (fig. 4), moreover it consisted of fibroblasts with fusiform nuclei. In the second case the tissue consisted of fine reticular fibers and fibroblasts.

<sup>1)</sup> Publication of the Netherlands Whale Research Group, Organisation T.N.O., Zoological Laboratory, University of Amsterdam.



On the surface of the liver a generally very thick layer of densely structured connective tissue was found. Just under this layer a less densely structured, reticular layer of connective tissue was situated with small groups of liver cells and bile ducts.

There were several cysts in the connective tissue; they sometimes showed a thin, indistinct mesothelial wall (fig. 5). These cysts varied much in size; the small ones measured about 50–330  $\mu$  in diameter, whereas the diameter of the large cysts amounted to about 2050–4100  $\mu$ .

It seemed that some cysts were multilocular: they were divided by septa into a number of cavities. Some cysts were filled by destroyed cells with remainders of nuclei and inflammatory cells. Some areas of the liver showed many cysts, whereas in other areas fewer cysts were observed or no cysts at all.

In the connective tissue a good many inflammatory cells were found, viz. polynuclear leucocytes, lymphocytes and plasma cells. The diameter of these plasma cells and their nuclei measured about  $6.8 \times 8.5 \mu$  and  $3.4 \times 3.4 \mu$  respectively.

The characteristic structure of the liver tissue was diminished entirely as a result of the progressive destruction. The liver cells were pushed aside and separated by the growing connective tissue, and were thus seen in small groups or solitarily (fig. 6). The nuclei of the liver cells were round or oval. Some liver cells contained vacuoles and small brown pigment granules. Also remainders of liver cell cords may be situated in the connective tissue.

The large and small bile ducts were embedded in fibrous connective tissue solitarily or in small groups (fig. 7). Their number was but small.

Locally areas of atrophic and necrotic liver tissue were found varying much in size (fig. 8). Sometimes the necrotic areas adhered together into large complex masses. In these masses remainders of cells and nuclei and small brown pigment granules were noticed. In some places red hyaline droplets were found, which must probably be considered as products of disintegration.

The blood vessels were of normal structure. The arteries showed a thick wall. No enlarged blood sinuses were found in this cirrhotic liver.

### III. Discussion

When this cirrhotic liver of the female blue whale is compared to the cirrhotic liver earlier found in a male blue whale (STOLK, 1953), it looked as if the structure was not the same. There were some differences chiefly concerning the microscopical structure, the quantity of connective tissue, the presence of cysts and of the arrangement of the liver cells.

In the cirrhotic liver of the female blue whale we found no granular and nodular structure, a very great quantity of connective tissue, a number of cysts and extremely isolated liver cells; in the cirrhotic liver of the male blue whale on the other hand a distinct granular and nodular structure, a

A. STOLK: *A new case of hepatic cirrhosis in the blue whale  
Balaenoptera musculus (L.)*

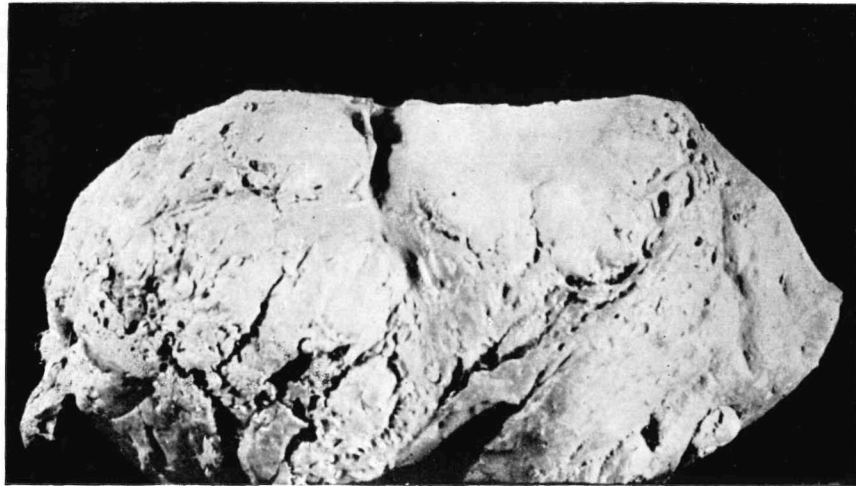


Fig. 1. Hepatic cirrhosis in a blue whale. Part of the liver with irregular surface.

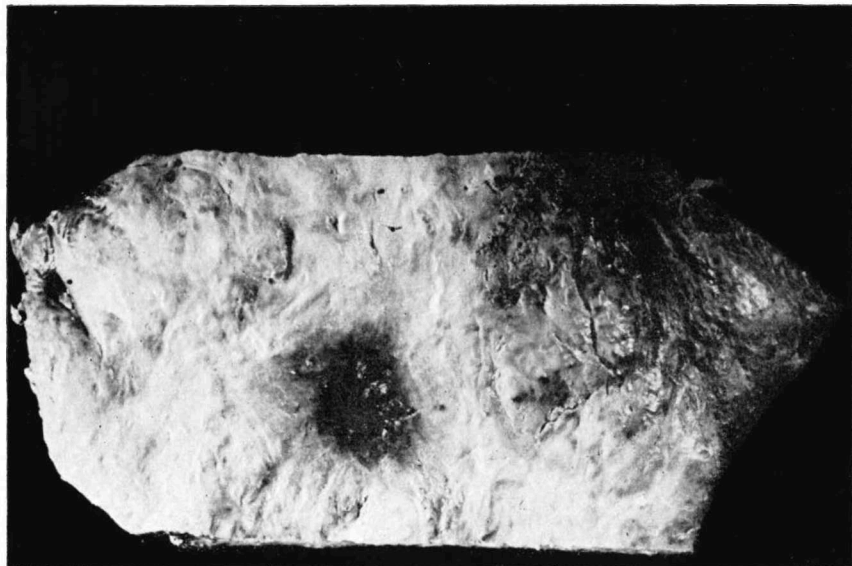
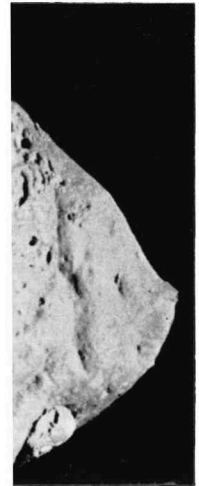
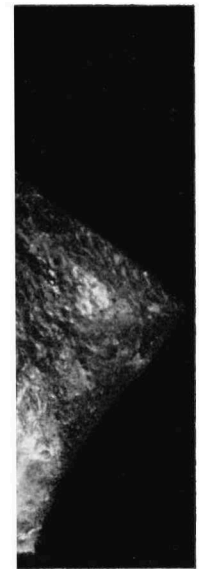


Fig. 2. Hepatic cirrhosis in a blue whale. Part of the liver with superficial, dark coloured necrotic area.



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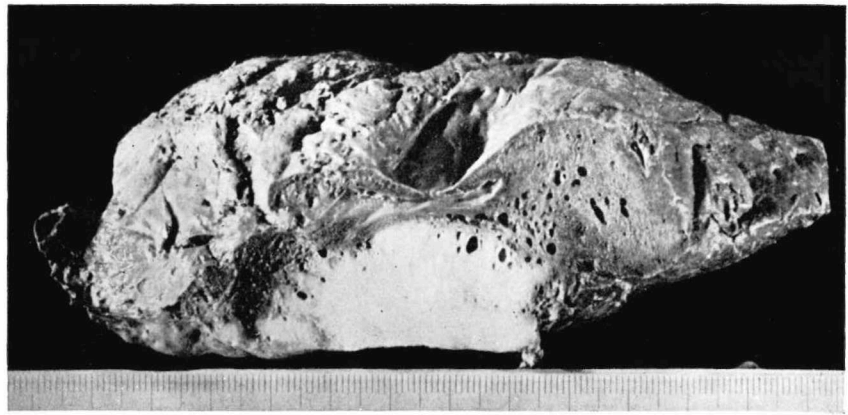


Fig. 3. Hepatic cirrhosis in a blue whale. Section of a part of the liver. Irregular surface. Liver tissue with cysts varying in size and lightly coloured necrotic area as well as some cysts.

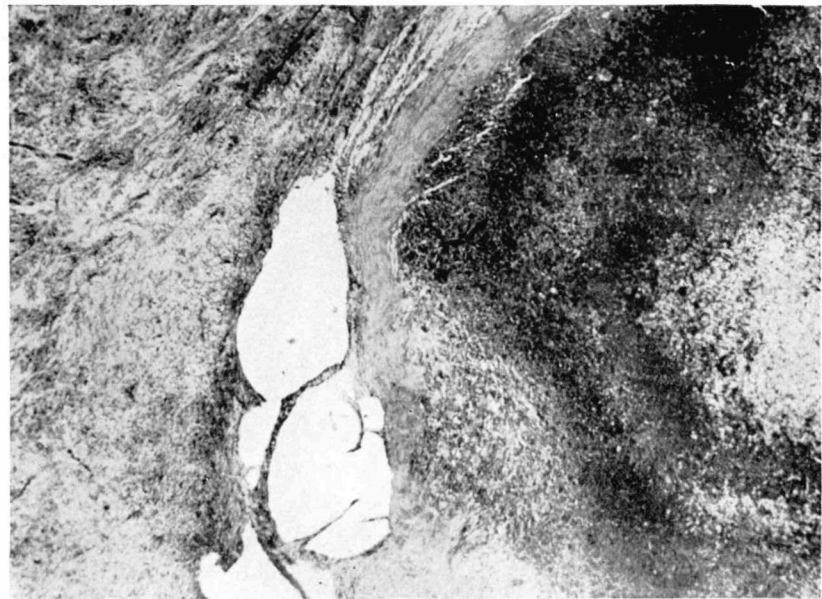


Fig. 4. Hepatic cirrhosis in a blue whale. Densely structured connective tissue consisting of waving collagenous fibers crossing one another in various directions and at different angles. In the centre some cysts. Right on the photograph necrotic area.

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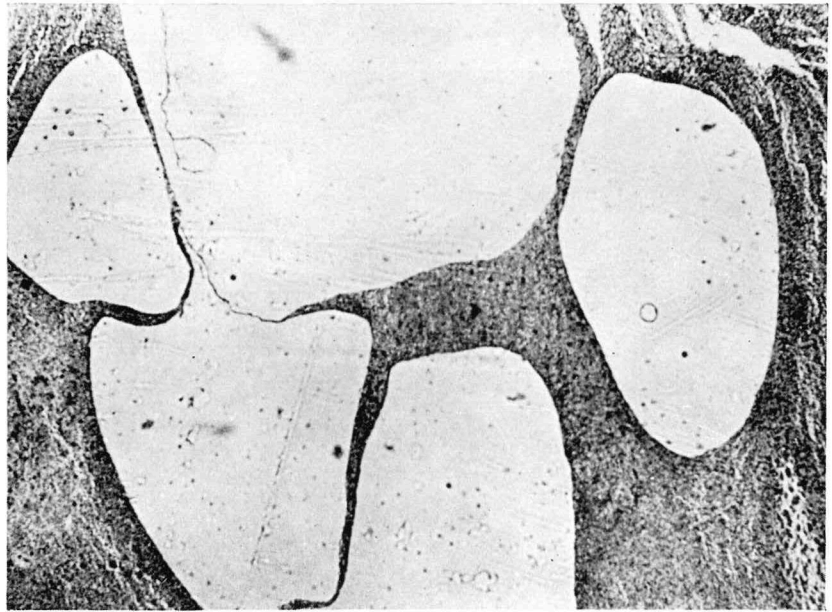


Fig. 5. Hepatic cirrhosis in a blue whale. Cysts varying in size separated by connective tissue.

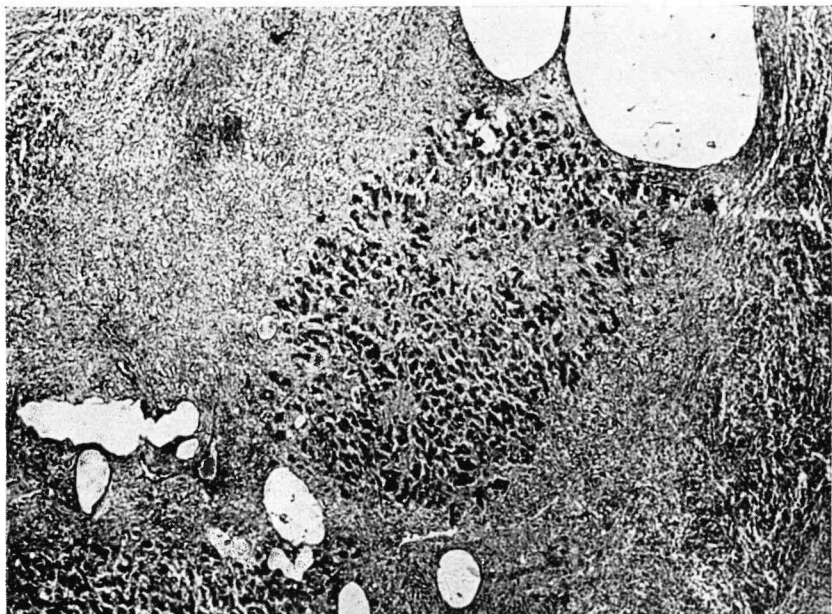


Fig. 6. Hepatic cirrhosis in a blue whale. Isolated liver cells separated by connective tissue. Large area of connective tissue consisting of waving collagenous fibers and fibroblasts. Left below and right at the top of the photograph some cysts.

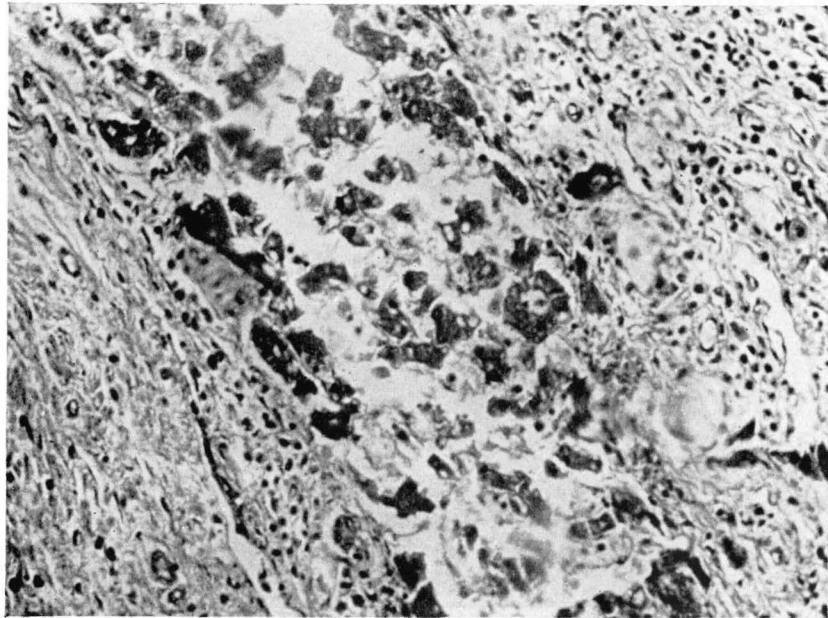


Fig. 7. Hepatic cirrhosis in a blue whale. Bile ducts embedded in fibrous connective tissue. Large area of connective tissue consisting of waving collagenous fibers and fibroblasts.



Fig. 8. Hepatic cirrhosis in a blue whale. Necrotic area.

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smaller quantity of connective tissue, no cysts and liver cells which were isolated, but generally not so markedly as in the cirrhotic liver of the female blue whale.

The hepatic cirrhosis of the female blue whale, described in this paper, slightly resembled Hanot's cirrhosis or hypertrophic cirrhosis in human pathology.

Probably this cirrhosis of the blue whale occurred after a hepatitis.

In our opinion this case must be considered as the second hepatic cirrhosis found in a whale. In the summarizing publication of COCKRILL (1951) this disease has not been reported.

#### Summary

Description of a case of hepatic cirrhosis in a blue whale (*Balaenoptera musculus* (L.)). Probably this cirrhosis, which belongs to the type of Hanot's cirrhosis in human pathology, occurred after a hepatitis.

#### Acknowledgements

The author wishes to thank the Board of Directors of the "Nederlandse Maatschappij voor de Walvischvaart N.V.", Prof. E. J. SLIJPER, Amsterdam, and Dr R. VAN DAM, Amsterdam, for their valuable advice and kind assistance during the preparation of this publication; he also wants to thank Mr W. L. VAN UTRECHT, Amsterdam and Mr W. H. E. VAN DIJK, assistant controller, for supplying the material for the investigation.

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