

Muscle-Tumours in the European Turbot.

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With 1 Figure in the Text.

IN 1913 a successful attempt was made to introduce the European Turbot to New Zealand waters. On 12 January of that year 298 young fish, caught in the neighbourhood of Plymouth, and kept for some time at the Marine Biological Station, were put aboard the *Waimana*. Of these fish 195 were safely transported across the tropics, and were put into the tanks at the Portobello Marine Hatchery. The operation was a very successful one, thanks to the care of the late T. Anderton, who was then Curator of the hatchery.

The turbot were originally from one to two inches in length. It was intended to liberate most of them in the sea, but, on consideration, it was decided to keep them in captivity. Three years later (May, 1916) there were still 182 fish, 5 having died and 8 having been liberated in the sea. They grew very rapidly in the tanks, so much so that in May of 1916 many were about 18 inches in length. To keep these large fish healthy was difficult, and so, in 1916, 128 of them were liberated in Taukutu Bay.

The remaining fish did not appear to be getting ready to spawn. It was unlikely that they would do so in small tanks. So, in 1917, all but 14 of them were liberated in Taukutu Bay. Thus, in 1922, there were still left in the Portobello Tanks these 14 fish. They varied in length, from 18 to 24 inches. With the two exceptions about to be noted they have been, to all appearance, very healthy.

On 21 November, 1923, one fish, 18 inches long, died, and on 9 December, 1923, another one, 17½ inches long, died. There were no obvious indications as to the cause of death (bar, of course, the tumours to be

referred to presently). On making a post-mortem examination it was noticed that the stomach, in both cases, was swollen, and that there were broken sores on its peritoneal surface. This suggests some septic illness. In both cases there were tumours on the blind sides of the fishes, on the dorsal parts of the bodies. These tumours were oblong patches, about $3\frac{1}{2}$ inches long and $1\frac{1}{2}$ inches wide, and they were slightly raised above the general body surface. Internally they extended down towards the skeleton. They were sharply defined from the surrounding tissues in that the affected flesh was soft and yellow, while the normal tissues were firm and white. Throughout the substance of the tumour there were bright red streaks, appearances not to be observed in the healthy muscle substance.

Parts of each tumour were cut out, fixed in Mann's fluid for three hours, washed in alcohol, and preserved. These were sent to Dr. Drennan, of the Pathological Department of the University of Otago. The report furnished by Dr. Drennan is as follows:—

“The tumour consists of large, striped muscle fibres, with the usual perimysium and blood-vessels between the fibres. Many fibres are cedematous and partly disintegrated. At the skin surface there is necrosis of tissue and acute inflammatory change. It appears to be a simple tumour of striped muscle—a ‘Rhabdomyoma’—with degeneration and inflammatory changes.”

No further cases of the kind described above have occurred among the turbot kept in the tanks at the Portobello Hatchery. Scrupulous cleanliness and careful feeding at regular times have always been observed, and it appears that death, in the cases of these two fishes, was due to some acute affection. The beginning of the illness was held to be a certain date at which a slackening of appetite was observed: a fortnight later the fish died. It is not likely that the presence of the tumours was the direct cause of death.

[NOTE BY DR. J. JOHNSTONE.—Mr. Young kindly sent me the above report, and also some pieces of the fixed tumour. The structure of the latter is, as the pathologist reported, that of a rhabdomyoma: it is a mass of muscle fibres which tease out in very much the same way as do the ordinary muscles of a normal fish. Yet this muscular tumour is an abnormal structure, as shown by the gross appearance of the tissue and its difference from the surrounding parts. Also the disintegration of the fibres over large parts of the tumour is very striking, and indicates a loss of nutrition, the accumulation of excretory products, and so the beginning of necrotic changes.

In some marginal parts of the tumour there is a curious compression together of the individual fibres. Between the latter there ought normally to be a system of spaces (lymph channels) and a delicate tracery of con-

nective tissue. This is altogether absent, and the fibres are closely apposed: the appearance is quite a strange one to anybody who knows the normal structure. Text Fig. 1 represents such a microscopic field seen in a microtome section. The black lines separating the various fibres represents a structure staining blue with Mallory's combination: it is really a sheet of compact connective tissue. It was obvious in teased-out preparations that the cross-striation of the fibres was far less well marked than the longitudinal striation, so that the fibres easily broke up into the constituent sarcostyles, and hardly a trace of the very characteristic transverse striation might be evident. The figure shows this longitudinal striation well. The fibres are cut transversely, and the



TEXT FIGURE 1.—Transverse Section of a few fibres from the tumour.
(Oil Immersion Lens.)

sarcostyles appear not as rounded fibrillæ, but as elongated, narrow plates, which tend to be arranged radially to the sarcolemma. This appearance rather suggests an embryonic character, which is, of course, what we should expect in the case of a malignant, rapidly growing tissue.

Rhabdomyomas are very uncommon among fishes. Adami (*Montreal Medical Journal*, 37, 1908, 163) has described such a tumour from a "lake trout," though this is not quite the same in structure as the tumour found by Mr. Young in the turbot. In a fairly large number of malignant growths in fishes I have never seen anything at all resembling a rhabdomyoma, and I think such a tumour must be of rare occurrence. It is interesting that those now noticed occurred in fishes kept in captivity, and in very exceptional conditions. The ordinary fish malignant tumour is a sarcoma. The connective tissue in the lower parts of the skin, or in the dissepiments between the muscle segments; or "flakes," or between

the individual muscle fibres begins to proliferate, grow and form an obvious swelling or tumour. As this increases in mass the muscle fibres gradually atrophy and disappear, pressed out of existence and starved by the huge accumulation of connective tissue. Here, however, the connective tissues have not grown at all, and the malignancy is exhibited by the muscle fibres themselves.

Rhabdomyomas are not uncommon among the mammals, and this case illustrates the essential similarity—not only in normal, but also in morbid histology—between the fishes and the higher mammals.]