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Title

A PRELIMINARY ACCOUNT OF THE OYSTER DISEASE OF  
1915-1916 IN MALPEQUE BAY

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Historical Summary

It is not attempted here to give more than a brief account of the disease which, starting in 1915, killed all but a few of the oysters of the bay. It was probably caused by a small parasite of some sort. The symptom most commonly mentioned in accounts of the disease was the occurrence on the body of the oyster of yellow spots or "pustules" containing a yellow liquid matter. These seemed to grow in size and number as the disease progressed and eventually the oysters died. When diseased the oyster was more susceptible to exposure to the air than when healthy, and exhibited other symptoms of weakness and unhealthy condition such as shrinkage so as not to occupy the whole shell, weakness of the adductor muscle as shown by ease in opening, etc.

The disease was first observed on the beds south of Curtain Island in the summer of 1915, but it is possible that it was present earlier and took some time to develop virulence and to start an epidemic of sufficient proportions to be noticed. Considerable quantities of oysters were killed in that district in 1915, and in 1916 it had spread to other parts of the bay.

The suddenness and thoroughness of the action of the disease is shown by the statements of Mr. G. S. Sharp of East Bideford. On examining his beds in the spring and early summer large quantities of healthy oysters were found and no evidence of the disease. He estimated the amount available for sale at almost 1,000 barrels but in the early autumn when fishing operations were commenced only a few barrels could be marketed, most of the oysters being found newly dead and many dying on shore a few days after landing.

Almost all the oysters of marketable size in Malpeque bay and its inlets were dead by the end of 1916. Then the disease apparently spread along the narrows between the sand-dunes and the mainland, reaching the waters of Cascumpeque bay a few years later.

Although almost all of the oysters were killed a few survived. At the heads of the inlets sets of spat occurred for the next few years but the great majority in all cases died before reaching marketable size - most of them, apparently, in their first or second summers. These appear to have survived on the average to an older age as time went on. In 1922 and 1923 Inspector Gallant reported that the district appeared to be recovering and that one- two- and three-year-old oysters were found in healthy condition, but that the beds were badly silted. Conditions improved still more and the oysters increased in numbers and lived to a greater age.

From 1925 on several barrels were fished in Bideford river and marketed. More would have been

obtained ...

obtained there in 1929 and 1930 if the area had been open for fishing.

Recent Introductions of Oysters from other areas.

When it was found that considerable quantities of oysters in an apparently healthy condition were present it was decided that the disease had died out sufficiently to warrant action to restore the oyster industry of the area. In the course of the work with that end in view, and, previously, in an attempt to test the presence or absence of the disease, introductions of oysters from other parts of Prince Edward Island were made and the results are of great importance. An account of these experiments follows. When brought together and considered with reference to the disease they seem to be of great significance.

1. In 1924 Mr. G. S. Sharp, planted several barrels of oysters of marketable size from Ermore on the south shore of the island. He placed them on his beds in the Narrows between Lennox island and the mainland of East Bideford. They appeared to be in good condition in the autumn after planting. Within two years, however, they were apparently all or almost all dead.

2. In the autumn of 1928 Mr. David Dodge, in the course of work for the Department in connection with the establishment of oyster cultivation in the area, obtained about 70 barrels of marketable oysters from Mt. Stewart on the Hillsborough river near Charlottetown. These were planted on the Gillis Point bed in Grand

river. Later that autumn they appeared to be in good condition, but in the following autumn when examined by the writer on October 27 there was considerable difficulty in obtaining any number. Of those which could be identified as belonging to this lot over a quarter were dead and of the remainder about a third had small yellow spots (up to about one eighth of an inch in diameter) on the surface of the body and on the mantle (the membrane lining the shell). The majority of the oysters showed no growth during the current year and many of them had shrunk so that they did not occupy the whole space in the shell. The latter was true especially of those which had the yellow spots. When examined in February the same symptoms were in evidence and one was found so recently dead that most of the meat was left in the shell. In June, 1930, these oysters were dredged up in ignorance of the extent of the mortality and only two or three barrels of them could be recovered.

The nature of the bottom was not very good, being a mixture of mud and sand not quite as hard as might be desired, but it was not sufficiently poor to offer a plausible explanation of such a death-rate. The oysters were well protected by wardens from poaching.

3. In the same autumn (1928) about 30 barrels of small oysters from Percival river on the south side of Prince Edward Island just west of Richmond bay were planted on the Gillis Point bed in Grand river along with those from Mt. Stewart. When examined later the same year they were in good condition. On October 27, 1929, only about a third of them were alive. As they

were in clusters and as starfish were present a considerable proportion of the deaths may have been caused by crowding or by the starfish. But similar yellow spots were observed in a few. Of the 30 barrels planted, only about five barrels could be recovered in June, 1930. When collected at Percival river these oysters were almost all one year old. Cysters of the same age taken from shores of Grand river did not show nearly as high a death rate when planted on the bed. These oysters were planted all on the same bed but could be distinguished readily. Those from Mt. Stewart were all single cysters of marketable size; those from Percival river were clusters set on pieces of sandstone, and those from Grand river smaller clusters attached to mussel shells. It should be noted particularly that of these three lots planted at about the same time on the same bed mixed together the native Grand river oysters showed the best survival.

4. Early in October, 1929, before learning of the poor condition and mortality among these other introduced oysters, the writer obtained sixty barrels of mixed large and small oysters from Enmore river with the end in view of establishing spawning beds for purposes of observation of the spawning in 1930 and as a source of spat. These were planted in Bideford river on two small beds. Thirty-seven barrels were planted in a patch about twenty yards square on a small hard bed just below Bideford wharf, specially cleaned of mussels and mud for the purpose. The remaining 23 barrels were planted on a patch of corresponding size

near . . . .

near the head of the river at the junction of Grant's and Sheagh's creeks. The bottom here was not nearly as good as the lower patch, being rather too soft.

Both lots of oysters seemed to be in perfect condition later that autumn with no deaths at all. This was also the case in the spring of 1930, but during the summer the oysters commenced to die. By September the greater part of the upper lot were dead and in November there was considerable difficulty in procuring a sample of 100 for examination. Those on the lower bed seemed to be later in commencing to die and a considerable proportion were still alive at the end of November, but here, too, over half were then dead. In both instances the oysters seemed to be in poor condition showing relatively poor growth as compared with near-by native Bideford river oysters. They were thinner and many of them shrunken. The same yellow spots were observed on them as on those in Grand river.

Thus in four separate instances of recent introductions of oysters into the Malpeque bay area - the only cases we know of - their condition later in the year when they were planted and in the following spring appeared to be good. But in each case the oysters commenced to die at some time in the following summer and most of them died before the winter. In each case where they were examined yellow spots were observed on the body surface and on the mantle and the specimens still living after the disease had commenced tended definitely to be thinner and shrunken.

Discussion of the nature and action of the disease.

The symptoms observed in these cases are somewhat similar to those reported for the disease of 1915-1916, and were probably the same in a somewhat milder form. It was found that oysters similarly thin and shrunken and showing the same kind of yellow "pustules" are present among the native oysters now in the Malpeque bay area, but only in very small numbers.

The following conception of the disease and its action is suggested on the basis of the above facts. As a starting point there can be little doubt that it was caused by a parasite of some sort - minute or microscopic. The proof of this lies in the manner in which it started in one locality and spread to others over a number of years and in the sudden mortality in the apparent absence of exceptional physical conditions in the environment.

Such diseases in man and other animals are combatted by the development of resistant strains and by the development of immunity or resistance by the individuals. In the former case the disease on its first appearance in a community may kill a large proportion of the population leaving only those best able to resist it. This selection may be repeated in successive generations until the population as a whole has a high resistance to the disease - the resistant strains have been selected and developed and the others destroyed. As an example of this we may cite tuberculosis among the North American Indians. In the case of development of immunity or resistance by individuals,

the latter, in combatting a non-fatal attack of the disease, develop factors which counteract it, and the individuals are then immune to the disease for a longer or shorter time.

Two other points regarding the action of such diseases should be borne in mind. The first is that individuals immune or resistant to the disease may carry the parasite with them without showing any symptoms of the disease, - "Carriers". The second is that the parasite tends to become weaker (less virulent) if it has to live for many generations in hosts that are resistant and may then become stronger (more virulent) after living even for only a short time in hosts which have little or no resistance. In other words the parasite thrives and becomes stronger under favourable conditions.

The above are established principles of the action of contagious or parasitic diseases in general and may probably be applied to this one. It seems probable to the writer that the disease was brought to Malpeque bay by the introduction of oysters from the United States in 1913 or 1914. The evidence in favour of this view consists chiefly of two points - (1) the extremely high mortality caused by the disease which suggests that it was something new to the population and against which no resistance or immunity had been developed, and, (2) the commencement of mortality soon after the introduction of seed oysters from the outside became general. It has been argued against this that no such disease was observed at the time in the localities from which the introduced oysters were taken.

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But this means simply that no exceptionally high death rate was noticed and it would be natural to suppose that the disease was an old one in those places and that the populations there had developed resistance to it, just as the native oysters in the Malpeque bay area seem to have done now.

After its introduction the disease spread to the native oysters which had no resistance to it and was able to flourish in them, so developing high virulence. This led to the death of almost all of the native oysters. Among the native oysters only the few which could resist the disease survived and those produced spat of which only the few most resistant grew to a marketable size. This accounts for the continued appearance of small oysters. Finally, by continued selection, by destruction of those which could not resist the disease and by continued production of spat by the few left, a race or strain has been developed which is highly resistant to the disease and which can increase in numbers and grow to large size in spite of the presence of the parasites.

Thus the oyster populations in the Malpeque bay area are increasing not because the disease has disappeared but because a resistance to it has been developed. The parasite has perhaps become less virulent again because it must live in oysters which have developed high resistance to it.

The death of the oysters introduced in the last few years with symptoms similar to but apparently not as well-developed as those of 1915-1916, is strongly

in favour of the view that the disease is still present (and probably always will be) but that the stock is resistant to it. It is further supported by the presence of a very few sickly oysters among the native Malpeque bay stock of the present time and by the similarity of the symptoms shown by these to those of the dying oysters which had been introduced from other parts of Prince Edward Island.

It has been suggested that possibly the present stock consists largely of the descendants of those introduced from the United States and that, therefore, it may represent a strain less well adapted than the original native oysters to the lower temperatures prevailing in the area. This seems highly improbable to the writer. The introduced oysters were planted on grounds in or near the open bay where conditions are not favourable for reproduction and, if these oysters are less well adapted to the lower temperatures, the conditions would be even less favourable to them. The best survival of oysters seems to have been in Bideford river many miles from the nearest introduction and so situated that the currents are unfavourable to bringing larvae from the United States oysters. The disease came only two or three years after the introduction of the latter and it seems very improbable that any of them had become established in Bideford river in that time. The best survival seems everywhere to have been at the heads of the inlets - i.e. in places as far as possible from the introduced oysters.

It must be realized that the native oysters are now quite healthy. They can remain healthy in spite of the presence of the "germs" which can cause the disease in oysters that are not immune. It must also be realized that there is no reason to fear that the disease is dangerous in the slightest degree to man. The healthy native oysters are no whit less fit for human consumption than if the disease had never existed. The only unfortunate effect of the disease is that it prevents the rehabilitation of the fishery by introduction of stock from other areas.

#### Conclusions regarding the disease

The following conclusions of a practical nature arise from the above consideration of the disease.

1. The disease has apparently not disappeared but a population which can resist it has been developed in the area. This is as good if not better than the absence of the disease and the latter ceases to be a serious danger if the local stock is developed.

2. Oysters introduced from other areas fall a prey to the disease and no good results can be obtained in that way. Not only is this true but there is danger of introducing other new diseases.

3. As the disease is still present oysters from the Malpeque bay area should not be planted in any other areas as the disease would probably be introduced with them.

4. The danger of transplanting oysters from one area to another is emphasized. The only sane procedure is to develop the local stock.

5. The development of the local stock without introduction of oysters from outside further necessitates cultivation of the oysters by all possible means.

6. The presence of the disease in no way influences the quality of the present native oysters or their fitness for human consumption.