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NEW ZEALAND.

# REPORT ON OYSTER CULTIVATION,

BY THE COMMISSIONER OF CROWN LANDS, SOUTHLAND.

*Presented to both Houses of the General Assembly by Command of His Excellency.*

## No. 1.

Mr. W. H. PEARSON to the Hon. the SECRETARY for CROWN LANDS.

SIR,—

Crown Lands Office, Invercargill, 24th July, 1877.

I have the honor to state that, in accordance with your request, I visited Stewart Island on the 13th February last, to determine as to the desirability of altering the close season under the present Oyster Fisheries Acts, with the view of meeting the wishes expressed in a memorial of the fishermen in that locality, and I beg to subjoin my report on the subject.

2. *Method of Investigation.*—The statements which will hereafter be made on good authority regarding the decadence, if not positive annihilation, of many oyster fields in Europe and the colonies, invest the subject with a peculiar significance and importance, particularly as there are certain unfavourable indications of a similar state of things existing in New Zealand. But this importance cannot be adequately appreciated and treated if those who may be employed have not at hand the results of the experience of skilled observers, and know somewhat of the natural history of the oyster. It is therefore in connection with preventive or remedial measures that I have thought it expedient to prefix, as succinctly as possible, the following observations relating to the habits of the oyster, its likes and dislikes, its friends and its enemies, so far as I have gathered them from reading reports on the Home culture of oysters, and from personal inspection of the Stewart Island beds.

3. *Local Importance of Investigation.*—That a careful study of the subject, and a wise discrimination towards developing to the utmost a resource so bountifully supplied by nature, is a matter of State moment, cannot be doubted by any one who is acquainted with the rapid decrease in Great Britain of this favourite and wholesome esculent—a declension which, notwithstanding that the subject has latterly received the earnest attention of Parliament, and investigation by several Committees appointed by it, appears, by past laxity, to have reached a point almost precluding the hope of resuscitation.

4. *Value of the Oyster.*—The serious consequences resulting from delay in judiciously cultivating an industry which enters so largely into the category of a wholesome and favourite food supply, is evidenced by the enormous rise in the price of oysters in the Home country. In Canterbury, Kent, for instance, some fifteen years ago, the price of oysters was 40s. a bushel, while in 1876 it was twelve guineas, being a rise of 500 per cent. The Colne Oyster Fishery Company, in Essex, paid for their oyster brood at the rate of 32s. a bushel in 1853–59, and in 1867–68, 130s. a bushel, being a rise in nine years of 306½ per cent. In Falmouth, Cornwall, the price of oysters rose from 9s. a tub (or 1,600) in 1863, to 45s. a tub in 1869. At Langham, Essex, in the year 1870, oysters were sold in the streets at 4d. per hundred, and now the merchants are paying 9s. per hundred for the same quantity. The cultivation of oysters, commercially viewed, assumes a position of great importance, beyond that arising from local consumption, as may be seen from the following facts: Mr. Henry Mayhew, in his book entitled “London Labour, and London Poor,” states that twelve years ago the number of oysters brought into Billingsgate Market in one year was 495,896,000, which, calculating at one penny each—at present an almost impossible low price in London—gives £2,066,120. The report of the Royal Irish Commission of 1870 estimates the annual consumption of England at £4,000,000. *Chambers's Encyclopædia* values the oyster trade in New York at £1,250,000 per annum. M. Coste, the eminent pisciculturist, commissioned by the late Emperor Napoleon to examine and report on the exhaustion of the oyster beds in the Basin of Arcachon, in his report to the Minister of Marine, speaks of it as “a veritable mine of wealth, which by judicious cultivation might be made to yield, from its 2,000 acres of bottom, uncovered only at low spring tides, an annual revenue of £600,000.”

5. *Necessity of Precaution.*—Even in America, where Mr. Frank Buckland is inclined to the opinion that the spat will never fail, owing to the superior warmth of the American waters, it was found that the oysters were running short. The plan, therefore, was adopted of only fishing half a bed in alternate years—a precaution which might well be suggested by the French experience of the Bay of Arcachon, where it is found that if the stock of oysters upon a bed is reduced below a certain point, the spat will not be numerous enough for any part of them to survive the attacks “of that minimum of enemies which may be looked upon as a constant quantity.”

In New South Wales, the Government having taken alarm at the decadence of their oyster fisheries, appointed a Royal Commission on oyster culture, which has reported to Parliament that, if the same reckless management of their oyster fisheries in that colony is continued, the supply will soon be insufficient for the demand. They show that great quantities of oysters, unfit for consumption owing to their being immature, are sold in Sydney for shipment to Melbourne; the effect being that "New South Wales oysters, which ought to be the finest in the world, not only get a bad name in the colony but also in Victoria." Thus, while the price will rise very much from the want of due precaution, and by over-dredging, which takes away all the old "scalps" from which a healthy fall of spat might be obtained, and the beds replenished, the oysters will diminish in size till they reach that lilliputian stage when the proportion of meat to shell, which in the best class of oysters is one-fourth, will be so trifling as barely to repay the trouble of opening. I am the more anxious to bring to your notice all the details in connection with the preservation of the natural oyster beds (though the recital may appear prolix), as I found that already, in the very infancy of the development of the oyster-fishery trade at Stewart Island, the same evils, resulting in the premature exhaustion of this industry, are in operation which have led to such disastrous results in the Home country and elsewhere. The Port Adventure beds in Stewart Island, though closed against dredgers since the 22nd July, 1872, do not show so healthy a recovery as might reasonably have been expected, while the deep sea bed lying along the shore from the north-east headland of Port William towards Saddle Point, which has been deserted for four years by the dredgers, owing to its infecundity, is still too poor to pay for working. I had it tried this year, and the report is that in three drafts only 12 dozen were obtained, when one good draft formerly realized from 25 to 30 dozen. The dredges, when pulled up, contained a far larger proportion of old shells and rubbish than of marketable scalps. The young oysters which should have been found adhering to the "culch" were by no means plentiful.

6. *Desirability of Stimulating the Culture.*—The advantage to New Zealand of stimulating her oyster culture, irrespective of local requirements, may be estimated by the opinion of Mr. Frank Buckland, expressed to a Parliamentary Committee in 1876—viz., "That the New Zealand oysters would shortly be sent in tins to England." In addition to this, the Australian market is easily reached and readily open, particularly to the import of Stewart Island oysters; for experience has shown that oysters properly cleaned and packed will live for six weeks without water. Melbourne is principally supplied with oysters by Sydney, but the demand is already far in excess of the supply, and the report above quoted shows that each year the supply is decreasing.

7. *Habit of the Oyster.*—Although the study of the oyster has for years received scientific investigation, no definite conclusion appears to have been obtained in regard to its habits, more particularly in the matter of its reproduction. Though most atoms will tell man something of their nature and habits, &c., the oyster is a perfect mute. Once only, in the earliest dawn of its existence, when leaving the parent shell, it launches its tiny boat on the ocean of time, and for a brief moment dances wildly on the stream of life, floating along, it realizes the joy of movement. That wild saturnalia passed with safety, and a resting place obtained, it settles down, possibly to moralize with calm impassibility on its six weeks' glimpse of the pomps and vanities of life, certainly to fatten for man's use. Its fitful dream of life is over, it is silent evermore. Violence may burst open the iron lips, but they will not whisper the story of its birth.

8. *Propagation.*—Sir Everard Home, after long investigation, has come to the conclusion that an oyster is purely hermaphrodite; that it will impregnate its own ova, as illustrated in the teredines and different kinds of eels, stating that in the case of "the oyster, which has no organs fitted for locomotion, and is consequently confined to the same spot, its propagation could not be otherwise carried on." Again he says, "The ovarium is not evanescent as soon as the breeding season is over; although to the naked eye it would appear so, for new ova very soon begin to form in it. The ovaria may be considered double, as in fishes having the liver separating them, one lying immediately under the membrane that lines the convex shell, the other immediately over the membrane covering the flat shell; the ova hang on pedicles attached to the membrane of the ovarium, and this membrane becomes thicker and more conspicuous as they increase in size. They are large enough to assume a distinct form in the month of March. When they have arrived at their full size, a white liquor of the consistence of cream is met with, in which they appear to float, probably secreted for their fecundation. This happens towards the end of June, and a tube has now become visible, although not before distinctly seen. It opens by one end in the edge between the two ovaria, and the orifice communicates with both of them. At this time the ova drop from their pedicles, and therefore have arrived at their full growth; and there can be no doubt of their impregnation having taken place in the ovaria, for those that are detected passing along this tube, which is the oviduct, have already acquired a shell, and each ovum is enclosed in a vesicle, so that the size of the ovum can no longer be ascertained; but the cell met with in the pearl, as I shall explain, must be an exact cast of it, when it completed its growth. The oviduct forms a sheath in which the intestine is enclosed, and terminates in an orifice between the lips at the mouth of the intestine, from which the young oysters pass out, mixed with a purple mucus intended for their nourishment. From this situation the opening and shutting of the shells of the parent oyster must throw out the young along with the salt water."

With this theory of hermaphrodite generation, Messrs. F. Buckland and most of the witnesses practically acquainted with the subject examined by the Committee concur. On the other hand, Mr. H. G. Austin, of Whitstable, states that after five or six years' minute study of the subject, with the aid of very powerful microscopes, he believes that the two sicknesses—the white and the black—are not emanations from the same oyster, as described by Sir Everard Home, but are distinct—the white sickness being the male oyster, the black the female, and that if these two sicknesses come together, the spat live. Mr. Austin explains that he had changed his former opinion, and has arrived at his present conclusion after the following experiment: He had oysters brought from the water and immediately put under the microscope, and he found that the oyster after being white sick does not become black sick, for he has kept it for a fortnight or three weeks "upon the shore in a large boat

with water running in at one end and out at the other, and muslin round it to prevent anything running out," and never found any change in the condition of the spat; "it never assumed the form of an oyster, but was simply globules of matter, whereas the black spat, just when you see it, is a small oyster alive, oozing from the body."

Mr. F. Pennell, who has given considerable attention to the study of the oyster, says that it "has not been and cannot be ascertained that the white sick oysters become black sick, or *vice versâ*;" while it has been found that some oysters are white sick and some black sick, and that in a common-sense view it is natural to assume that one is a female and the other a male. As against this view Mr. G. Hart—no mean authority on oyster culture—states that "he kept the white spat for a period of fourteen days, and during that time it gradually changed into black spat." During this period he daily put one or more of the spat under a solar microscope, and making drawings from it he found that the black spat developed itself into small oysters. He therefore concluded that the spat when white should not be emitted from the shell, "it lying in the mouth of the oyster like a mass of cream, and, if things are going on rightly, it will remain there until it turns black before it is thrown out;" in fact, that the emission of white spat arises from accidental circumstances, the seed not being matured until it becomes of a black colour, when it is ready to adhere to its future home.

If Mr. Austin's theory be correct, and the emissions of the white and black spat are distinct, and similar in nature to the milt and roe of the herring, they must amalgamate for reproduction to take place. It is therefore important that the waters in which these substances are floating about, seeking to be intermingled, should not be disturbed by dredging, and thus their fusion be prevented. This important point will be further dealt with towards the end of this report.

9. *Age at which Spatting commences.*—Even the age at which an oyster begins to spat has not been clearly determined. Mr. Buckland is of opinion that an oyster spawns sometimes at three and sometimes at five and six years old, generally at from four to six, "when they become adult, and that would be before they were six years old." The age of the oldest oyster with which he was acquainted was from twelve to fifteen years, judging from the ridges upon its back. From three to seven years is the age at which an oyster is marketable in England, though at Arcachon, in France, it is fit for the market much earlier. He is also of opinion that oysters do not spat every year, for he says that "if all the oysters bred every year, there would be nothing but oysters at the bottom of the sea." Mr. Austin believes that oysters begin to spat at two years old, when about the size of half-a-crown. Mr. Baker is also of opinion that oysters spawn earlier than allowed by Mr. Buckland; in fact, oysters have been known to spat at a year old, but the spat was considered immature. There seems, however, to be no agreement among authorities on this point—a subject of regret, as it is highly undesirable that a bed should be dredged for sale before the oysters have had an opportunity of at least twice "proclaiming the story of their birth," otherwise their extermination becomes simply a question of time; it being borne in mind that all the oysters in one bed do not spat the same year. The Home oyster begins to be white sick, or to brew its spat, about the middle of May, and in the middle of June it begins to spat. The process is thus described by Mr. Buckland: "The old oyster opens her shells, and gives a quick clap with them, and sends out its spat in a great cloud. The best illustration I can give of it is to see the smoke of a railway engine on a frosty morning, or, as Mr. Pennell says, 'When it (spat) is emitted, it is more like a puff of dust from the road.'" M. Figuier, in the *Ocean World*, thus describes the process: "Nothing is more curious to witness than a bank of oysters at the spawning season. Every adult individual of which it is composed throws out a phalanx of progeny. A living dust is seen to exhale from the oyster bank, troubling the water, and giving it a thick cloudy appearance, which disseminates itself little by little in the liquid, until it dissipates and loses itself far from its focus of production."

10. *Movements of Spat.*—The parent oyster not being able to move, it is natural to expect the young fry should be provided with such means of locomotion as would enable them to colonize fresh tracts of ocean bottom, and, to quote Mr. Buckland, "Nature has provided each little oyster with a ciliated coronet: it is covered with a great number of very minute hairs or cilia; these minute hairs or cilia play with a very rapid action indeed, and they give these little oysters the power of swimming in almost any direction that the oysters like. I have observed that oysters when put in a large glass of water will remain mostly at the bottom; and that is very important to recollect, because what happens in the bottle is happening at the bottom of an oyster bed. They then remain at the bottom of the bottle, where they move about in a very rapid way, exactly like ants when you move an ants' nest. Then from time to time the little oysters swim up to the top with a wavy motion, and having got to the top they play about at the surface of the water just in the same way, or nearly in the same way, as you see the whirligig beetles on the top of ponds. Then, having done that, they sink again, and I think they close their shells when they sink, because they go down just like a balloon out of which the air is leaking."

To quote M. Figuier, "The spat is soon scattered far and wide by the waves, and unless the young oyster finds some solid body to which it can attach itself, it falls an inevitable victim to the larger animals which prey upon it. In this its infant state, when it has just left the protection of the parent shell, the microscope reveals the young bivalve as having a perfect shell, and having an apparatus, which is also for the time a swimming-pad, ready to adhere to the first solid body which the current drives it against. This pad or cushion is furnished with vibratile cilia disposed round the young shell. Aided by the powerful abductor muscles, with which it is also provided, this cushion is projected through the water at the will of the young inhabitant, which has every facility for the purpose." In fact, the baby oyster is blown into existence quite complete, the image of its mother, shell and all, with more than the usual advantage of youth over age in the matter of volition. It can not only open and shut its shell like its mother, but can, during its brief spring-time of life, go where it chooses or is driven. The wisdom of this provision of nature for volition is apparent, for the parent oysters would undoubtedly be smothered by their offspring were they all to remain on the same bed, and fresh ones would not be formed.

11. *Formation of Oyster Bed.*—Mr. Buckland mentions several instances of the establishment of

young colonies of oysters, such as the flats outside Whitstable, in England; at Blaukenburg, off Holland, the produce of the store-beds near Ostend; and a bed discovered out at sea off Shoreham, the produce of spat floating away from the oysters stored at Shoreham. In his opinion "the oyster spat may be said to swarm like bees; they go to different parts of the bottom of the sea, and there they rest; they will swim with the tide, and where the tide stops, if they are in the proper humour, down they go; and if the bottom of the sea is fit for their accommodation, they will make an oyster-bed, and if it is not, they will die."

12. *Requirements for Formation of Beds.*—Heat and tranquillity are, in Mr. Buckland's opinion, the alpha and omega of successful oyster production. In support of this theory, he observes that, "finding the spat was most lively at mid-day, when the sun was shining right hot upon them, I took some of them and put them into a tube glass, and experimented upon them in this way: If it is cold, that causes a failure of spat; the cold will kill these little oysters. I put my tube into iced water very gradually, and as the oysters in the tube got colder they began to tremble, and ultimately fell down to the bottom, and there was an end of them. Up to a certain point, I found I could resuscitate them by taking them out and putting them into warm water again, when after a time they gradually revived. I found that if I held them in the cold too long they died. The temperature they liked best was from 65 to 72 degrees; when the temperature got below 50 degrees (say 44), they would be dead." As regards tranquillity, he says, "Wind and waves are great enemies. If you have a stormy day the little oysters are *bouleversé*, and their shells broken; they cannot go anywhere, and they get thrown against the shore: it is no use for them to attempt to get on at all. The picture of a good spatting day, as I have often thought, is a hot summer's day, when you see the cows standing up in the water, and the gnats flying about in the air—just as you see the gnats flying about, so the young oysters float about; if the wind blows the gnats go, and the young oysters go also." That heat and tranquillity have much to do with a successful spatting favourably influencing the mother and offspring, is evidenced by the operations of Major Heath, in the artificial cultivation of oysters in Corio Bay, in Victoria. Some three years ago he took over from Stewart Island several thousand oysters, and laid them down in a very sheltered part of Corio Bay, and he writes to me, "The New Zealand oysters spat about four to six weeks after I brought them over. The temperature of the water is, I expect, much higher here than at Stewart Island, as it ranges from 58° in the winter to 76° in the summer;" and of this spat he adds, "They are doing well, as they are acclimatized, and are a good size, being now three years old." These parent oysters must have been at least a fortnight or three weeks from the time they were dredged at Stewart Island to the time of their being deposited in Corio Bay. As an indication of what warmth and tranquillity will accomplish, he states, "The close season is here from November to February; but from what I have found on the tiles, the oyster spats nearly all the year round in Corio Bay."

In the Basin of Arcachon it has been ascertained, by careful observation during the years 1854 to 1876, that the fall of spat depends on the weather and temperature during the spatting months. Whenever the weather is recorded "very cold" the fall of spat is recorded as "very bad," "nil;" while where the weather is represented fine and warm the spat is reported "very good;" "much rain" or "rain and stormy," "bad."

As regards America, a correspondent of Mr. Buckland's, writing on the successful oyster culture of the Americans, says, "In fact I can see no other feasible reasons to be advanced by our trans-Atlantic cousins for their well-known success, than that the warm waters of the Gulf Stream run along the coast, and that they have intense, almost tropical, heat in summer."

Of his own experiments at artificial cultivation at Reculvers, Mr. Buckland says, "We put in a great number of *huîtres mères*—breeding oysters, and the first year produced nothing; the water was full of spats as the air is of midges sometimes on a summer afternoon, yet not a single spat stuck upon a tile. The next year *embarras de richesses*—I did not know what to do with them. I bought half the tiles of a church, and put them in; all these tiles were covered with oysters, and everything in the pond caught spat. Why was that? One year was cold, and this year hot; that is all the difference."

The next thing to getting a good spat from an oyster bed is to preserve it. Captain Johnson, who has charge of the Isle of Wight fisheries, in his evidence on this point states, "I have had my spat" (*i.e.*, in artificial beds) "floating in very good condition in the morning, but at night the whole of the floating spat has been dead, owing to a thunder storm. The greatest amount of oysters we ever had was four millions, and I am quite sure we had forty-four millions or more of floating spat to produce that. This shows an enormous waste, but there are certain reasons for that; we have to contend with vermin in the shape of shrimps and small fish. I have seen them lying under the shell of an oyster, and, when that oyster has spat, dart out and swallow the spat, and enjoy it amazingly. The goby, a small bull-headed fish, and the young mullet also, are very destructive to them. I have caught them, and put them under the microscope, and found the spat they have swallowed in their stomachs."

13. *Favourable Sea Bottom on which to fall.*—The spat having escaped so far the dangers incidental to its youth, has now to find a safe resting-place for the remainder of its natural life. Carried away by winds and currents, its brief day-dream over, it settles down either to live or die. Sand and mud mean sudden death; as Mr. Buckland says, "Recollect that if you have sand anywhere near your oyster beds they have the sword of Damocles always hanging over them: a sand storm may come and cover them all over at any time." What a storm does in shallow water the currents do in deep sea beds. Mr. Saunders says, "You cannot have an oyster properly propagated where you have either mud or sand; you must have a hard bottom." Sand chokes the oyster, mud smothers it, and sea-weed in any quantity is destructive to it. Stones, dead mussel shells, cockle-shell culch, and above all oyster culch, if clean, means life. To quote Mr. Buckland, "But what suits them best is the natural proper culch which you find at the bottom of the sea, the shell of its own relatives, especially empty shells and old rotten oyster shells. The culch must be clean, or they will not stick to it." Having found its bed, the young oyster attaches itself to it, the point of adherence being near the summit of the lower concave value. If detached by accident or otherwise, and thrown on its wrong side, it can turn itself over.

14. *Food Supply*.—Once settled for ever settled, until dredged up, the oyster must squat in a locality favourable for obtaining a proper food supply. The late Mr. Reade, a patient and learned microscopist, after examining the stomachs of oysters, says, "In the stomach of every oyster I examined, and in the alimentary canal, I found myriads of living monads; the 'vibrio' also in great abundance and activity, and swarms of a conglomerate and ciliated living organism, which may be named *Volvox ostrearius*, and great numbers of other creatures belonging to the Diatomaceæ, monads being those microscopic things found in dirty water and ponds. The family of Vibrionidæ include the eel-like microscopic animalcules found in stale paste, vinegar, &c., apparently belonging to the vegetable kingdom, according to Cohn, to which the Volvocinæ are also generally believed to belong. In fact, as Mr. Buckland says, "It is a question whether the food of the oysters are living animals, or whether they are the highest forms of vegetable life. By some it is said they are the lowest form of animal matter, which feed on decayed vegetable bodies; and I think the latter theory is probable, the fact being that the oyster lives upon the minutest organisms which exist in the ocean." Major Heath, writing with his practical experience of Corio Bay, Victoria, says, "All depends on the locality and food for the oyster, for unless you have blue clay somewhere near, or in the bed, they will starve." Blue clay being, I presume, in that locality, the most prolific of animalculæ.

15. *Growth*.—The growth of the oyster depends much on the locality; it grows very fast or very slowly, according to the water in which it is. In England it reaches its marketable size in from three to four years. In the Basin of Arcachon, in France, it is marketable when twenty-seven months old. In Corio Bay, Major Heath informs me "Sydney rocks" do well, making as much as one inch of shell in three months." To again quote Mr. Buckland, "The oyster grows from the inside by throwing out rings of a calcareous or else of a glassy substance. The growth of an oyster is by circles every year, and by practice you can make out when his growth begins and ends for the year. The oyster, according to Figuier, "is quite microscopic at the period of its discharge from the parent shell; at one month it is of the size of a large pea, at the end of six months it is about three-quarters of an inch, a year after its birth an inch and a-half to two inches, and finally, at the end of three years, it has become merchandize—that is to say, it is in a state to be sent to the parks for preservation and feeding."

16. *Nourishing Powers of Oysters*.—Oysters, according to Mr. Buckland, contain "hydrochlorate of soda, hydrochlorate of magnesia, sulphate of lime, sulphate of soda, and sulphate of magnesia. Much phosphate of iron and lime, much osmazone or creatine—which is the same thing as the essence of meat—a certain quantity of gelatine and mucus, which renders it so digestible, and an animal material of which phosphorus is the principal ingredient." Those whose labour lies in headwork will find that nothing puts them better into "form" than oysters; and, as Reveille Parise says, "There is no alimentary substance, not even excepting bread, which does not produce indigestion under given circumstances, but oysters never; one may eat them to-day, to-morrow, eat them always, and in profusion, without fear of indigestion."

17. *Meat Value*.—Mr. Buckland, after careful investigation, has calculated the value of the meat of the oyster, as compared with mutton, to be as follows:—Taking the best Whitstable natives, purchased at 3s. 6d. per dozen, the meat costs 9s. 4d. a pound; in the case of second-quality oysters, purchased at 2s. a dozen, the meat costs 8s. a pound, while good mutton can be bought for from 10d. to 1s. a pound. Thus to cheapen an article so wholesome for food, by increasing its production, will confer a very great public benefit.

18. *Points*.—The oyster, like most animals, has its good points. The most valuable class of oyster is that in which the shell is very thin, and feels to the touch like china; for the thinner the shell the more room there is for the meat, and the larger the proportion of the latter to the former, which in the best class is one-fourth of meat to shell; in the second, one-fifth; and in the third, one-sixth. The oyster should have a deep shell to hold the meat, should grow fast, and fatten readily.

19. *Friends*.—Heat and tranquillity may be considered the best friends an oyster has. The first assists and stimulates the parent oyster to brew and exude the spat, and both are necessary to enable the baby to live through its infancy. Shot as it were into life, if it is met with a cold embrace it withers and dies at once, while strong winds drive it to destruction. A single thunder storm has been known in England to destroy millions of spat floating in shallow water. Cleanliness means life to the baby oyster. It will not adhere to anything which is not clean; and unless it fixes itself within a given time after its birth it dies. Cleanliness is also necessary, though perhaps in a lesser degree, for the parent oyster, as dirt harbours its active enemies and in time chokes it. With calm sunny days in which to spat, and a hard clean bed to lie on, the parent and offspring cannot do otherwise than increase and multiply at a rate which, as has been proved in some parts of the world, is simply marvellous.

20. *Enemies*.—If the oyster requires few friends, the name of its enemies is "legion." Were it otherwise, the space it would occupy in the economy of nature, from its extraordinary prolificness, would prove inconvenient. Its enemies may be classed as inanimate and animate. Under the first head, the category may be considered as follows: Cold, which kills the spat; sand, which gets in between the lips of the oyster-shell and keeps them open, and which sometimes buries whole beds of oysters; wind and waves, the injurious effect of which has been previously described; mud, which smothers oysters; land floods, which seriously affect oyster beds in shallow water, the pure fresh water killing the oyster; sea weed and all marine weeds which foul the ocean bottom, and thus with the dirt they cause destroy the spat. Of the animate enemies of the oyster, the most formidable is the "five-fingers," or star-fish proper. Mr. Buckland says, "These creatures, I have ascertained by watching, open the oyster by catching hold of it by their five fingers, and they have the power to protrude from the centre of their disc an elastic stomach, and that elastic stomach gets in between the shells of the oyster and presses them open, and then the star-fish will eat up the inside of the oyster and leave it, as it is technically termed, "a clock"—that is to say, the two shells joined together, the meat of which has been eaten out by the star-fish." One of the worst features in this maritime robber is that if one of its fingers is broken off it will grow another, and indeed it is questionable whether the broken finger will not grow a whole body if thrown back into the sea. The

next enemies are the "sea burrs" or Echinidæ, which eat spat; then the "whelk-tingle" or "dog-whelk," a very serious enemy indeed: it bores holes into the young oysters, and destroys large numbers in a very short space of time. Mr. J. Wiseman illustrates this in his evidence before the Parliamentary Committee I have quoted from so largely. He says, "Some two years since I had a fall of spat upon one of my grounds, when my manager reported to me that the dog-whelks had begun to attack those oysters. I sent my staff as soon as I could, within a week; but when they got there they found they had destroyed about £2,000 worth. I then had to remove the whole of the rest of the oyster spawn from the river Crouch, &c." The only way of combatting this enemy is by dredging and throwing it ashore, otherwise it will increase with great rapidity. Then comes the sponge called "clione," which adheres to and rots the shell of the oyster by getting into it, rendering it quite fragile to the touch. This disease Mr. Buckland has christened "clionitis," and describes it as doing a great deal of mischief to oysters. Exposure of the oysters affected with it to the rays of the sun cures this disease, as the sun kills the clione and prevents its growing again. Mr. Banyard speaks of a sort of sponge which he calls a "squasher," generated by the sediment which collects more or less on all oyster-grounds. These squashers grow so very fast that, speaking of his own oyster-grounds, he says, "If those grounds are not worked, they (the squashers) will accumulate so much that we shall not get a shell upon our grounds." Then come shrimps and different varieties of small fish, notably the "goby," a small bull-headed fish, and young mullet, which destroy millions of spat—shrimps are particularly destructive to spat—while crabs and lobsters eat the small oysters. Thus, in each stage of its existence the oyster runs a gauntlet for life. From the first moment of its birth fish and shrimps hunt it; that danger passed, mud and sand escaped, a safe bottom found, the dog-whelk courses round it with the view of boring the soft young shell with its sharp tongue; and crabs and lobsters seize it in their joyous embrace. Should maturity be reached, the oyster has to accept the intrusion of the stomach of the five-fingers into its own, and become the sapless thing above designated a "clock," or be smothered by squashers, choked by sea-weed, or have its shell destroyed by clionites; and even yet there are two dangerous though passive enemies to be encountered—the crow-oyster and the mussel. These may be said to resemble the cuckoo in the sparrow's nest, and, though not actively antagonistic, simply crowd out the oyster. The crow, or saddle-back oyster, has "a round hole at the bottom holding itself on to its attachment by means of a stone pedicle."\* Its spat resembles the spat of the ordinary oyster, and takes up its room. "The mussel is one of the greatest hindrances to the development of oyster-beds that we know of. They act in two ways: first of all, they will live in places where the oyster will not; secondly, they send forth their armies of spat, and the armies of young mussels will fall down upon the oyster-beds and spin their webs over them like beautiful silk ropes, by means of which they hold on to rocks and other things. They accumulate mud, and the mud covers over the oysters, and it is a case of mussels *versus* oysters; and the oysters, unless they are protected by the proprietor, generally get the worst of it." All these enemies eluded, the oyster has to face man, his worst foe, with his insatiable greed—a greed which, in its unwise intensity, swallows up the morrow to gratify the thirst of to-day. Overdredging by man will destroy in a day what the oysters' natural enemies could not accomplish in years. Mr. Brazier, in his evidence before the Parliamentary Committee of 1876, states that a Mr. Maple, having discovered an oyster-bed off Shoreham, obtained in one day 17,300 oysters. "The oystermen saw him dredging, and a few days afterwards there were forty smacks at work upon that very bed, from Selsea, Brightlingsea, Southwick, and other places; and Mr. Maple states that in *one single day* they cleared out this entire bed"—a statement which Mr. Brazier had reason to believe was perfectly true. Could the force of rapacity go further?

21. *Stewart Island Oyster Fisheries.*—With the light of the Home experience, as detailed in the foregoing pages, I can with greater assurance advise on the method which ought to be pursued to protect and beneficially utilize the beds already discovered and worked at Stewart Island. The first deep sea oyster-bed, situated off the west head of Port William, lying from 12 to 15 fathoms below the sea surface, on a rocky bottom, was opened up about nine years ago, and was dredged until it became too poor to pay. It has now had a rest of five years, and yet, as I have already mentioned, it has not sufficiently recovered to pay for working. Why this is so, none of the oyster-dredgers can tell me. The real reason I believe is the want of dredging or trawling, not for purposes of denudation, but of cultivation. The oyster-farm on the sea bottom requires as careful attention as the farm on the earth's surface. To obtain a fair return the ground must be kept clean; everything injurious to the existence and proper development of the oyster must be taken away; fresh culch must be added, and proper rest given—*i.e.*, rest from being carried to market for consumption. In England and in France it has been ascertained that it is absolutely necessary constantly to dredge or trawl an oyster-bed, even in the close months, to protect the oyster and its spat from their natural enemies, dirt, sponges, sea-weed, dog-whelks, and particularly five-fingers. An oyster-bed once broken up by the dredge is more easily accessible to the inroads of its enemies, the worst of which, the five-fingers, obtains in such circumstances a peculiar advantage. On the necessity for dredging during the close months to clean the oyster-beds, the evidence taken by the Committee to which I have already referred is almost unanimous. Mr. Banyard, who has been engaged in oyster cultivation and dredging for from twenty to thirty years, states, "My experience has proved that keeping the culch clean is essential for the reception of the spat, and the months of May, June, and July are the very times when the oysters spawn. I am the owner of three oyster-layings, and I have, in the months of June and July, dredged one side of a laying, and have had spat there because I have *worked it*. Upon the other side of the same laying I have *not dredged*, and there I have had no spat. The layings were under precisely the same conditions. This Blackwater River has been very greatly improved by continuous dredging, and it has also been very much extended in the last twenty years. For instance, where there used to be mussels and five-fingers in the Blackwater, there is now a beautiful soil, clean and fit for the reception of spat." Mr. G. Harvey, an oyster merchant of thirty years' experience, speaking about the over-

\* Mr. F. Buckland.

dredging of the public oyster-grounds, says, "They are not over-dredged. There is a proof of that because you see Herne Bay is lost, which the dredgemen made, and it only requires to be known that they can go and dredge there the first fair wind, and they would be off to make it again—there can be no doubt about that—making it by cleansing it again from all the accumulations of five-fingers and the other enemies." Again (Mr. F. Buckland): "I do not think it would interfere a bit with oysters to dredge them during spatting time as hard as ever you could go until you see the first spat upon a shell; then you must stop. That dredging would be with the view of keeping the culch clean to the last minute. Dredging the beds and keeping them carefully cleaned is the *sine quâ non* of oyster culture. Dredging is absolutely necessary to clean the grounds in the summer months."

To the question of the Committee, "But does not it enter into your calculation at all that it is right to give some rest to the oyster-beds?" Mr. F. Buckland replies, "I think not. I say, do not take them away. By rest I do not mean quietus or sleep, because you must not do that; I mean they must be continually dredged and dredged and dredged to keep the place clean." To the question "Whether it would not very much injure any oyster-bed for breeding purpose if dredging on it were always permitted, for the sake of taking stock from it to other beds?" he says, "It would do them all the good in the world if you dredge them all the year round, and keep the culch clean, and sell the little oysters and put the breeding ones back. The increase comes from the breeders left in the beds." In reply to the question "Whether it is a good thing to go on disturbing the culch during the spatting season," Mr. H. S. Goody says, "I do not think it does any injury at all. Whatever little injury there may be is more than compensated by the good that is done, because I do not apprehend that the spat falls all in one week or month." Again, Mr. F. Wiseman: "Why, the mere fact alone of allowing an oyster-bed to remain quiescent for two or three years would be the means of causing the growth of crustacea, mud, and weed, and bring on the very evil complained of and so much dreaded—namely, the ruin of the oyster fisheries." I know several oyster merchants who work their grounds during the time spat is falling; they invariably get more than those who leave off as soon as spat can be seen adhering to the culch. I have several cases in point, having proved it for years, where several beds were worked till spat was seen, and then left for a fortnight; after that interval the grounds were found covered with mud, weed, and slime; the result was that those who kept on dredging had more than double the quantity of spat. If an oyster-bed will get foul in a fortnight, how much mud, weed, &c., will accumulate in two or three years if left untouched." Now, with regard to the enemies of the oyster, five-fingers, dog-whelks, &c., how can they be kept down except by dredging? I am in favour of dredging during the summer months, because it is necessary that the grounds should be worked during the summer months, to cleanse them and prepare them for the reception of spat." With such evidence before me, I think it is not difficult to conclude that the reason why the oyster-bed off Port William Heads, to which I have referred, has not improved much during its five years' rest, is because it has not been kept clean by dredging during those years, and that until it is dredged its infecundity will continue; and there are two other deserted beds off the same coast similarly situated. If this view be the correct one, it affects not merely the beds under consideration, but every bed at Stewart Island which may be discovered—dredged till too poor to work, and left a prey to five-fingers, dog-whelks, &c. Thus, the total exhaustion of the beds and cessation of the industry becomes a mere question of time.

21. *Bed being now worked.*—The bed in Foveaux Strait, situated off Halfmoon Bay, lying between Bench Island and Fish Rock, at a depth of 19 to 23 fathoms, on a hard, clean bottom, and which has been dredged for from three to four years, is beginning to give signs of being worked out, though it is a mile long by one and a half miles broad. The oysters dredged up this year are larger in size than any seen since the opening up of the bed, an indication, the dredgers tell me, that the original bottom is being reached, and the first parents—the patriarchs of the bed—are being torn from their resting-place of years. There has been also a far larger proportion of small oysters brought up in the dredges than formerly. So apparent is it that this bed requires rest from dredging for consumption, that the fishermen who are working it have petitioned me to get it closed. It will be closed by my request from the 20th instant to the 28th February, 1879, when it will be left a prey for mud and slime to settle on, and the natural enemies of the oyster to hold an undisturbed jubilee for nearly three years. I dredged for two hours on this bed early this year, and saw in every dredge which was hauled up great numbers of "five-fingers," sponges, crabs, sea worms, and other rubbish.

22. *Dredging for Cultivation.*—To dredge for cultivation or cleansing is readily undertaken in England, where the expense of the process is met by the sale of the "brood" or young oysters to owners of beds for artificial cultivation; and, as there is always a ready sale for "brood" and "ware," it pays the dredgers directly very well, while they profit indirectly by cleaning the natural beds during the close season. Here, however, where there is no such measure of recouping them for their time and labour spent in constant dredging during the five close months of each year, and where the individual interests and desires of each cutter-owner by no means harmonize, it cannot be expected that the dredgers would undertake the expense and trouble consequent on keeping clean deep sea beds far out from shore, without any remuneration other than that of reaping a harvest in the future, which may be equally shared by those who have had no hand in tilling the field.

23. *Suggestions for Methods to be adopted for Cleaning Beds during Close Season.*—There are three ways by which the Government may meet the difficulty. First, by leasing for a period of years portions of oyster-beds to individuals or companies. Secondly, by offering a premium to dredgers to catch and deliver on shore to some authorized person the dog-whelks and five-fingers, paying them at the rate of so much a bucketful, or some other measure which may be determined on, the expense to the Government being recouped by imposing a tax upon the sale of oysters. Thirdly, by the Government employing cutters of its own, with responsible crews, to constantly dredge or trawl over the closed beds, carrying all the dirt and enemies of the oyster to the shore. This expense to be also met by a tax upon the sale of oysters, a higher license fee for dredging for them; and if these were found insufficient to cover the cost, the Government cutters might occasionally be employed in dredging for oysters for sale during the open season.

24. *Merits of each Method: Leasing Parts of Oyster Beds.*—As regards the first proposition—

leasing portions of the oyster-beds for a period of years—though there would not be much difficulty in buoying off the respective areas, and though for such exclusive rights the rents might realize a good sum, I question whether the real object, that of keeping clean the beds during the close months, would be attained unless a strict supervision was established to enforce dredging during those months. The system of grants of sea bottom and foreshore to private individuals and companies for oyster cultivation, under conditions of forfeiture if not usefully employed, has met with the approval of the Parliamentary Committee before alluded to, and in France it is very generally and largely adopted. But I question whether in either country the sea bottom leased for the purpose lies at so great a depth and so far out to sea as at Stewart Island—two important considerations as affecting the question of expense in working. However, the experiment might be tried as regards portions of some of the deserted beds already referred to. With proper periodical inspection, and a condition that an unfavourable report would lead to the determination of the grant, the experiment might prove successful and lead to valuable results.

25. *Second Proposition: Offering Premiums for Cleaning Beds.*—The second plan, that of offering a premium for all dog-whelks, star-fish, five-fingers, and Echinidæ or sea-urchins dredged off the beds and brought on shore, is one which prevails amongst private lessees of oyster-beds and companies in England. Mr. James Wiseman, in his evidence before the Committee so often alluded to, in reply to the question, “Whether it is necessary to give strict orders to destroy dog-whelks, &c., in dredging?” says, “Yes; so much so that each of the men receive 1s. for a bucket (which is a small measure) for all the dog-whelks they destroy. Nothing is given to them for destroying five-fingers; but they are capital manure, so that they save them and take them on shore for their gardens.” This system of premiums might be tried. It is possible that during the close season the fishermen, having nothing for their cutters to do, might be willing to dredge for small remuneration; but care must be taken that they do not carry off the oysters to shore as well as the vermin. It has this advantage: that while the dredger gets paid for destroying only two or three of the oyster’s enemies, he destroys a number of others, inanimate as well as animate, such as sea-weed, ordinary weeds, mud, &c.—in fact, cleans the bed at a cheap rate.

26. *Third Proposal: Government to undertake the Cleaning.*—The third proposition, that of Government cutters with responsible crews, would be the best and surest way of combating the evil; for while probably such would be the most directly expensive, it would prove ultimately to be the cheapest, as being the most thorough in the execution of the work. I have no doubt the dredgers during the close season would gladly let out their cutters, or work by contract, to clean the beds; but some responsible person should be on board each cutter to see that they did the work completely. That cleaning the beds constantly is life to the oyster, and leaving them dirty, a prey to their enemies, death, has been proved by the experience of Great Britain and France, in which latter country the regulations for enforcing dredging for cleaning are very stringent. Prolific as the oyster is, experience has proved it can be exterminated more rapidly than it can breed.

27. *Exhaustion of Beds in Australia.*—In Tasmania, Adelaide, and Victoria, the oyster has long become a thing of the past, on which memory may feast itself. In New South Wales also it is rapidly approaching that interesting stage when it may be mentioned as a recent bereavement; while in New Zealand it will share a similar fate as population increases, unless stringent measures are at once adopted to prevent it.

28. *Port Adventure.*—The Port Adventure oyster may be considered a first-class oyster. Its shell is thin, deep, and not too large, the proportion of meat to shell being greater than in the deep-sea oyster. In delicacy of flavour, it is superior either to the deep-sea oyster here or to any I have tasted in Australia, resembling much the pure Home native. The beds in this locality were at one time singularly prolific, and lying in shallow water, varying from one to two fathoms, could be worked by hand and a “dogrel” or small net fixed at the end of a pole. As I have mentioned in my report on Stewart Island, addressed to the Provincial Secretary, Dunedin, of the 23rd January, 1875, a cutter of 18 tons sailed into Oyster Cove, Port Adventure, and filled up in a very short space of time by shovelling the oysters up into the hold. The Maoris, many of whom lived at that time at the Maori Reserve in the port, used to fill their boats in a similar manner. Easily obtained, the beds were being rapidly exhausted, when in July, 1872, they were, on my recommendation, closed against dredging. They have remained so now for five years, and yet I do not find that they have increased to anything like the extent which might naturally have been anticipated, the reason being, I believe, that the beds are covered with an accumulation of dirt, sea-weed, and vermin, the result of having remained so long undisturbed. I examined them in 1875, and also in February of this year, and each time I noticed both in Oyster Cove and Heron River—where the best beds are situated—an amount of sea-weed which could not have been healthy for the oysters, and a singularly large quantity of oyster culch or dead shells, showing a mortality which can only be accounted for by the supposition that the star-fish or five-fingers and dog-whelk have been holding high revel for years, while the absence of brood or small oysters on the culch was remarkable. The ground in Port Adventure must, from the description given, resemble that in the Basin of Arcachon, Isle de Re, and Gulf of La Fosse de Loix, in France, where the artificial cultivation of oysters is carried on with such success, and therefore should be treated in a similar manner—that is, the beds should be leased to individuals, to be farmed under restrictions securing a proper cultivation. In Oyster Cove, at a rough estimate, there are about 112 acres of sea bottom at a depth of from one to two fathoms, a portion of which is uncovered for a few hours at low spring tides. In Abraham Bay there are 114 acres, and in Heron River about 234 acres. This bottom, at one time covered with oysters, I would recommend to be leased by auction in such lots and for such a term of years as may be determined on careful inquiry. The lessee to forfeit his lease if, on inspection by the Government, it is found that he is denuding it too largely, neglecting to keep it clean, or breaking any of the conditions of the Oyster Fisheries Act. To throw these beds open for the public to work means simply utter destruction in one year. Having been kept out of Port Adventure so long, the fishermen will take care to work the oyster-beds so thoroughly that it would not be worth while to close them again. To let them continue closed would also be injurious, as in reality it is preserving the



oysters for star-fish, dog-whelks, &c., instead of for human beings. The only course to utilize the beds thoroughly will be to lease them as I have stated; the purchaser of the lease having a right to hold a piece of the land opposite his sea-bottom during the term of his oyster lease.

29. *Artificial Cultivation, Basin of Arcachon.*—In France the artificial beds or parcs are of various sizes. One of a M. Mechin, 30 yards in length by 25 yards in width, yielded in two years 50,000 oysters. From the Basin of Arcachon, in 1871-72, 10,022,740 oysters were exported off 1,458 acres of parcs; and in 1875-76, 7,413 acres yielded 196,885,450 oysters. Mr. W. E. Hall, who at the request of the London Board of Trade went over to France to inquire into the reasons of French oyster fisheries being so much better than the English, states that the oyster parcs, as a rule, are under  $2\frac{1}{2}$  acres in size, which he considers as too small to pay. For artificial cultivation the natural features and advantages of Port Adventure cannot be surpassed; but as this interesting branch of the subject is beyond the limits of this report, I will reserve it for a future occasion.

30. *Proposed Alterations in the Oyster Fisheries Acts:—*

- (1.) Elasticity in regard to close time, and other provisions.
- (2.) The establishment of a gauge-ring.
- (3.) The appointment of Inspectors of Oyster Fisheries.
- (4.) Provision giving power to make by-laws or regulations under the Act.

(1.) *Suggestions for amending Oyster Fisheries Act.*—All legislation for regulating the conduct of any scientific enterprise should be elastic, so that the regulations may be altered and adjusted to suit the particular necessities of a locality, or a phase of circumstances previously unknown, as experience develops them; any cast-iron rule leads either to positive injury to the industry intended to be fostered, or necessitates a constant change in the Act. Science is ever progressive. The man of to-day blatantly exclaims Eureka; the man of to-morrow blandly explains his predecessor to have been a fool. Mr. W. E. Hall, already alluded to, in his report to the London Board of Trade, writing of the superiority of the oyster fisheries in the Basin of Arcachon over other French fisheries, states that though the orders of the *Réglement* of 1853 have been generally obeyed in all the French oyster fisheries, "no other fishery exists in which the latent powers of the *Réglement* have been applied so consistently or over so long a time as at Arcachon; no other has been so minutely supervised, and in no other have the regulations been so carefully adjusted to the supposed requirements of the beds from year to year." In fact, the superior success of this industry in this particular basin rests on the elasticity of the regulations. As an example of the inadequacy of the provisions of the New Zealand Act to meet the requirements of the position, the 6th clause of "The Oyster Fisheries Act, 1866," fixes the close season, during which the oyster is supposed to be spatting, to be the months of November, December, January, February, and March for both islands. This close season cannot possibly suit the warm climate of the North Island as well as the colder one of Stewart Island. All experience shows that warmth has a marked effect on the spatting of the oyster. In England it has been found impossible to fix any particular months, the difference in the temperature of the water on the two coasts necessitating an alteration in the time. For the Thames, Mr. F. Pennell advises a close time during July, August, and September, stating "each oyster fishery requires its own laws, and should be worked according to its local requirements." Mr. H. G. Austin recommends for Milford Haven the months of June, July, and August to be closed, while he states that upon the west coast of Ireland they breed all the year round, and that in Luce Bay his company had a fair spat one year in November. In reply to the question, "I suppose in advocating a close time you would advocate a different close time at different places?" Mr. Austin answers, "Undoubtedly; one close time would not do for all." Mr. Hart recommends a close time for ordinary oysters from the end of April to the 1st of September, but for deep-sea oysters the close time to be extended to the 1st October. Mr. Burt advises May, June, July, and August as close months, but states that the oysters in shallow water throw off spat sooner than the deep-sea oyster, owing to the greater warmth of the water. Mr. Farrer, the permanent Secretary to the Board of Trade, is of opinion, "If you have a close time it must be done *locally* and not generally, and *must vary* according to the *locality*. I would leave the question of close time entirely to the local authorities." Ireland again requires different treatment, and so on. The Select Parliamentary Committee of 1876, to which I have referred, after recommending a close time for oyster fisheries, adds, "A power should, therefore, in the opinion of your Committee, be intrusted to the Board of Trade, after inquiry, to shorten, vary, or determine this close season in any particular case." In fact, even as regards Stewart Island, the stereotyped close season of the Act of 1866 is, I think, a mistake. The oyster-dredgers are unanimous in the opinion that a close season should begin in October, instead of November, as at present; and should end in the middle of February or beginning of March, instead of at the end of that month. The data on which they found their opinion as regards the first point is the simple fact that nearly all the oysters, amounting to thousands, dredged during October, and sent up to Dunedin last year, were found on arrival to be unfit for use, owing to their being full of spat; in fact, the oysters were in that condition which I have described in section 9 of this report as "brewing spat." As regards opening the season earlier, I may state that on the 20th of February I dredged on the deep-sea oyster bed lying off Halfmoon Bay, the one which is now used by the dredgers, and out of fifteen dozen I examined I could not find one with spat in, the oysters being in splendid condition. I would therefore recommend the close season to be altered as follows: To be closed from the 1st October to the end of February, instead of as at present from November to the end of March, so far as Stewart Island is concerned. I would recommend, therefore, an alteration in the Oyster Fisheries Act, which, while providing that there should be a close season for oyster-dredging, leaves the particular time and locality in which it is to come into operation to the discretion of the Government.

(2.) *Gauge-ring.*—I would recommend the establishment by Act of a size-measure for oysters, known in England as a "gauge-ring," leaving the exact gauge for each locality to be fixed by Proclamation by His Excellency the Governor, according to the information received by the Government. In the evidence before the Parliamentary Committee of 1876, Mr. Buckland is of opinion that

a 2-inch gauge should be established in certain localities; while at Boston Deepes and Lynn Deepes the gauge is  $2\frac{1}{2}$  inches. Mr. Austin is in favour of a  $2\frac{1}{2}$ -inch gauge; Mr. Hall recommends  $1\frac{1}{2}$ -inch for "natives;" Mr. Digby proposes a 2-inch for oysters from the Blackwater. Mr. Hart is of opinion that the gauge for the south of England and the Channel oysters should be a little larger than 2 inches, while Mr. Brazier approves of a 3-inch gauge for the Channel oysters, objecting to a uniform gauge for all fisheries, recommending it should be made local according to the different sorts of oysters. The penalty for a breach of the regulations fixing a gauge should be heavy, and a large proportion of it given to the informer, as it may be more easily evaded than most of the other regulations, particularly if an export trade in oysters is established with the Australian colonies. It is the export of too small oysters from New South Wales to Victoria which has ruined the Sydney oyster fisheries; and I am inclined to think that this year very small oysters have been sent from Stewart Island to Dunedin.

(3.) *Appointment of Inspectors.*—I would propose that Inspectors of Oyster Fisheries should be appointed, with full powers to enter and examine into all the circumstances under which, not merely the public oyster-beds are being worked, but also any leaseholds for artificial cultivation, or natural beds, such as those at Port Adventure, which may have been leased; a penalty being imposed for refusal on the part of a lessee of an oyster-bed to furnish information to the Inspector, or for obstructing him in the discharge of his duty. The Commissioners of Crown Lands in their respective districts might be appointed, and thus no extra expense would be entailed for this duty. That Inspectors should be appointed is a self-evident proposition. To stipulate by Ordinance that a business is to be conducted under certain restrictions without providing any machinery for supervision is absurd. If, however, such inspection is conducted by the Commissioners of Crown Lands, it should be an instruction to them that they must make a study of the subject theoretically and practically, so that their advice to the Government might have the weight of authority. The theory can be readily obtained from books, and the practice by observation and inquiry. In England the Parliamentary Committee of 1876, in their report, recommended that the regulations of the Oyster Fisheries Act "should be enforced under the superintendence of Inspectors."

(4.) *Provision for making By-laws or Regulations.*—The provision for making by-laws or regulations by Proclamation from time to time to suit the circumstances of a locality, or meet the requirements of a larger experience, is a very necessary one. It is the power of making these by-laws which has proved so beneficial to the oyster-culture of France, more particularly in the Basin of Arcachon, as I have previously noticed in this report. In starting any new industry, constant change in its treatment is a chronic phase, and these changes can be more conveniently and speedily met by by-laws or regulations than by perpetual alteration of the Act itself. In New Zealand oyster-culture is in its earliest infancy, and capable of a very large extension if judiciously managed.

31. *Appointment of Parliamentary Committee suggested.*—As my remarks apply only to the oyster fisheries at Stewart Island, and as, so far as I am aware, there is no report regarding this matter from other parts of New Zealand, more particularly the North Island, where I have heard the oyster-beds are very prolific, I may be allowed to throw out a suggestion that it might be well if a Parliamentary Committee was appointed to investigate and ventilate the subject, with the view, not merely of protecting and developing the industry, but of affording information to those who are prosecuting it. I may further suggest that statistical information should be obtained as regards the export of oysters from the different oyster-fields during the few past years, either coastwise or to the adjacent colonies. One of the prominent peculiarities of the evidence collected by the Parliamentary Committee of 1876, from which I have quoted, is the divergence of opinion on the various points connected with the propagation of oysters by those whose length of experience and careful study of the subject would naturally lead to the belief that any opinion expressed would carry the weight of authority. This difference of opinion is probably owing to climatic and other local causes, and indicates that a careful local examination and supervision of the habits of the oyster should be held by persons theoretically as well as practically acquainted with the subject, to preserve for posterity what nature has so bountifully supplied, and which will prove, before many years are passed, a beneficial source of revenue, and a thriving industry supporting a large population.

The Hon. the Secretary for Crown Lands,  
Wellington.

I have, &c.,  
WALTER H. PEARSON,  
Commissioner of Crown Lands.

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