1913.

NEW ZEALAND.

FISHERIES OF NEW ZEALAND

(REPORTS ON), WITH RECOMMENDATION FOR ORGANIZATION AND ADMINISTRATION BY L. F. AYSON, CHIEF INSPECTOR OF FISHERIES.

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

Marine Department, Wellington, 10th June, 1913.

The Secretary, Marine Department, Wellington.

I FORWARD a report on the fisheries, as required by the Hon. the Minister of Marine.

L. F. AYSON.

SIR,— Marine Department, Wellington, 10th June, 1913.

As instructed by you, I have the honour to supply the attached report on the fisheries of the Dominion, with recommendations for their organization and development.

According to instructions, I wrote to England, Scotland, Ireland, Canada, Cape of Good Hope, and all the Australian States (copy of letter attached) for information regarding the administration of the fisheries in these countries. There has been considerable delay in getting replies from several places; as a matter of fact, I have not yet received a reply from Tasmania, and that from Cape Town only came to hand last week. This has delayed the preparation of my report, which otherwise could have been ready some time ago.

Very full and valuable information was given by most of the countries applied to; and copies of the various forms in use, and fishery laws and regulations, were also forwarded, and I enclose with this a *résumé* of the information supplied.

The letters received, and also the forms and copies of fishery laws, &c., are in my office, and available for your perusal whenever required. In the meantime I am going through and making notes from them.

I trust the recommendations made in this report will meet with the approval of yourself and the Government, and that the Government will see its way to have them given effect to. I am convinced, if carried out, that they will result in the fisheries being put on a solid footing with regard to organization and development.

I ask to be given an opportunity to develop the fisheries, and with a free hand and the necessary amount of money I will undertake in a very short time to have the fisheries of this Dominion placed on a better footing than any of the fisheries in Australasia.

I shall be glad of an opportunity of conferring with you regarding the proposals made in this report and other fishery matters whenever convenient for you.

I have, &c.,

L. F. AYSON,
Chief Inspector of Fisheries.

The Hon. F. M. B. Fisher, Minister of Marine, Wellington.

A REPORT ON NEW ZEALAND'S FISHERIES.—THEIR PRESENT CONDITION AND FUTURE DEVELOPMENT.

[By L. F. Ayson, Chief Inspector of Fisheries.]

Introduction.

In islands such as those which comprise this Dominion, situated as they are between the 34th and 47th parallels of latitudes south, and washed by sub-equatorial and sub-antarctic currents, the conditions surrounding the fisheries must be very various, and these conditions can only be determined by careful and systematic study.

In her fisheries (both sea and fresh water) New Zealand possesses a most valuable asset, as her natural advantages in this connection are undoubtedly superior to any other country in the Southern Hemisphere.

With its great extent of coast-line, splendid harbours, and numerous sheltered bays, and with an abundance and splendid variety of edible fishes, this Dominion must in time become a great fishing-centre in the South Pacific, providing for its people a regular and abundant supply of this necessary food, and, besides, developing a large export trade in fresh, cured, and canned fish and oysters to Australia, the South Sea colonies, and other countries.

In all countries which possess large supplies of food fishes the harvest of the sea is recognized as a great and extremely reproductive one for the employment of labour and capital, and there is no doubt that when the fishing industry of this Dominion is placed on a proper footing capital will be readily invested, and that it will at once become one of the important and profitable sources for the employment of labour. The value and importance of New Zealand's fisheries at the present time are as nothing compared with the possibilities which the future holds.

Administration and Present Condition of the Fisheries.

Administration.—The fisheries at the present time are administered by and as part of the Marine Department. The fisheries staff consists of a Chief Inspector, who has the general supervision of all the fisheries, and acts as adviser to the Department on fishing matters; an Assistant Inspector at Bay of Islands, Auckland, Dunedin, Invercargill, and Bluff. All Collectors of Customs are also Inspectors under the Sea Fisheries Act, and a number of Police officers are appointed Inspectors where it is considered necessary, and paid a small salary for their services.

Condition of the Fisheries, &c.—The number of vessels licensed to fish in 1912 was 1,179, and the number of men employed in connection with the industry was approximately 1,500.

As no proper system of collecting fishery satistics has yet been adopted, the total quantity of fish brought in and marketed during the year cannot be given.

The value of the fish, oysters, and fish products exported in 1912 was as follows:—

	£	s.	d.
Fish of all kinds	33,746	0	0
Oysters	2,984	0	0
Whalebone	3,196	0	0
Whale-oil	2,052	0	0
Fish—cured, canned, or otherwise preserved	13,485	0	0
Total value	55,463	0	0

The total value of dried, salted, and cured fish imported in 1912 was £108,105.

Fishing-vessels.

The introduction of the motor-launch has been of immense assistance to fishermen, and at the present time there is scarcely a sailing-vessel in use anywhere; and every year there is an improvement in the class of vessels built, as it is found that the man who can afford to build and use the large and more powerful boats has a decided advantage over the smaller vessels, as he can go farther afield when necessary, and also make more regular and quicker trips to and from the fishing-grounds. The high price of benzene at the present time comes hard on the fisherman, as it considerably reduces his actual earnings, and also prevents him from taking the risk of prospecting for new grounds.

Systems of Fishing.

The principal methods of capturing fish for market up to the present have been by means of hook and hand-line, seine and set nets, and trawling. Fishermen are, however, commencing to realize the necessity of adopting more up-to-date methods. In this connection it may be mentioned that in the Hauraki Gulf and Cook Strait a number of the fishermen have adopted a system of long-lining, which is proving very successful, and a great improvement on the single hand-line. Trawling with oil-launches is now quite common on a good many of the grounds. It was first tried in Cloudy Bay, Cook Strait, and, proving successful, fishermen in other places took it up. At Timaru, at the present time, there are eight launches fishing in this way, and with very good results. There is little doubt that in a short time long-line fishing will be in general use throughout the Dominion, and we hope to see other methods of taking the pelagic forms of marketable fish-life adopted, such as drift nets and purse seine nets.

Fishing-grounds.

Up to the present time it may be said that the fishing-grounds which have to be worked are only those within easy reach of the principal markets, and beyond those, there is a vast extent of coast-line which has practically never been fished, and on which is to be found abundant supplies of our best market fishes. The fishing-grounds which have been systematically worked are as follows: Bay of Islands; Whangarei; from Mokohinou to Mercury Islands, including Great Barrier, Hauraki Gulf, and Thames Gulf; part of the Bay of Plenty, off Tauranga; from Poverty Bay to the Kidnappers; from Cape Palliser, through Cook Strait, to Farewell Spit, including Tasman and Golden Bays; a section of the Marlborough coast off Kaikoura; and from Motunau Island round Banks Peninsula; a section of the coast off Timaru; from Oamaru to Cape Saunders; and from Coal Point to Chaslands Mistake; from Waipapapa Point, through Foveaux Strait, to Preservation Inlet, and round Stewart Island. On the west coast of both Islands the only fishing done is in the Hokianga, Kaipara, and Manukau Inlets, and a little at Westport, Greymouth, and Hokitika. So that there is a very large extent of coast-line which has never been fished for the market, and an immense extent of off-shore deep-sea grounds which have so far never been explored.

Some of the old fishing-grounds within a certain distance of the larger centres are not now producing anything like the quantity of fish which they have done formerly, and in several places fishermen find it necessary to keep moving farther afield in order to get the supplies required. The cause of this decline is, I consider, due to overfishing and the predominance of sharks, dogfish, and other enemies of our market fish. There are some in this country who ridicule the idea of the possibility of depleting any fishery. In this connection, Professor Prince, Commissioner of Fisheries for Canada, a gentleman who has had special training in marine biological research work, says, "One of the most important conclusions reached by the investigations of experts in recent years is that all important fishes are local in their range. The old idea that all fish migrated over great distances has been exploded. It has become more and more apparent that they affect their own local areas *and that such local areas can be exhausted more or less completely.*" And in another article on the same subject he says, "Most fish have their special local range. They loyally linger around their own native haunts, and only lack of food or some potent physical cause will induce them to change their ground." The late Professor Spencer Baird, who was one of America's ablest fishery experts, laid down the same principle very clearly when he said, "In all discussions and considerations in regard to sea fisheries one important principle should be borne in mind, and that is, that every fish that spawns near the shores has a definite relationship to a certain area of sea-bottom, or, in other words, that as far as can be judged by experiment and observation every fish returns as nearly as possible to its own birthplace to exercise the function of reproduction, and continues to do so, year by year, during the whole period of its existence."

With regard to overfishing, Professor Prince says, "While it must be admitted that the ocean, taken as a whole, is inexhaustible, yet established fisheries are confined to specially prolific areas, and such areas will bear the exhausting process of utilization only to a limited extent, or their reproductive and recuperative capacities will be too severely taxed. Overfishing may be effected in many ways, but the principal are the too constant and uninterrupted pursuit of the fish, so that when feeding or engaged in spawning they are harried and destroyed without cessation." Mr. E. W. L. Holt, Scientific Director of the Fisheries Board of Ireland, in his evidence before the Select Committee of the House of Lords which was appointed to take evidence and report on the Sea Fisheries Bill, in 1904, when questioned with regard to the decrease of flat fish on the trawling-grounds in the North Sea, said, "My impression is that fish has in nature, without the interference of man, quite enough to do to keep his species up; and the balance would appear to have been upset by human agency."

I have drawn somewhat extensively from the statements of these well-known scientific fishery experts in order to show that in their opinion fishes which inhabit the inshore waters and shallower banks are local in their life habits, and that it is possible to exhaust such fisheries by the agencies of man. The areas I have mentioned as suffering from overfishing are not very extensive; in fact, they may be considered as a mere bagatelle in comparison to the fishing-grounds round our coasts which have as yet not been exploited. At the same time, their condition proves the possibility of exhausting the inshore fisheries and the necessity for certain conservative measures.

Protective Laws and Regulations in Force.

These consist of—(*a*) Limiting the size of the mesh of nets; (*b*) limiting the size at which certain fish and oysters may be taken and marketed; (*c*) prohibiting trawling within certain limits; and (*d*) prescribing a close season for certain fishes, oysters, and seals. As will be seen by the information received from England, Scotland, Ireland, Canada, and all the Australian States, restrictive and protective measures are in force, and on similar lines to ours.

Development of the Industry.

A person inspecting a map of New Zealand can scarcely fail to be impressed with its extensive coast-line in comparison to the aggregate area of its three main islands; and considering, too, in connection with this its wonderful fresh-water system, one would naturally come to the conclusion that fish (both sea and fresh water) should be one of its people's principal articles of diet. That it is not so may probably be accounted for by the fact that in the past beef, mutton, and other meats have been readily obtainable at very reasonable prices—that our people could find more regular and remunerative employment apart from fishing—and the very irregular supply of fish prevented people from depending on it to take the place of other foods. A great change has, however, taken place during the last few years. The steady increase in the price of all our food products and the

large increase in the population of our towns and cities has caused a very large increase in the demand for fish, and I think it is quite correct to say that at the present time the demand for fish by our own people exceeds the average supply coming forward; so that if for no other reason than the interests of the people's food-supply, it is imperative that a great deal more attention should be given to the development of the fisheries. Up to the present New Zealand's fishing industry has not been given anything like the attention its importance demands. As one of the most important food-supplies for its people, as a source of employment, and as an industry capable of developing an important export trade it deserves being given a more important place than some departments on which large sums have been and are being spent; and I would strongly urge that its development should now be taken in hand vigorously, scientifically, and practically, and for this purpose I beg to make the following recommendations, viz.:—

1. That the fisheries of this Dominion (sea and fresh water) be administered by a department to be called "The Fisheries Department."

2. That the coastal waters out to 100 fathoms be scientifically prospected *section by section*; the Government to purchase a properly constructed and equipped vessel for this work.

3. That the Government encourage practical fishermen to engage in fishing by advancing money for the purchase of suitable boats, and by supplying professional fishermen with benzene and lubricating-oil at cost price, plus transport and working expenses.

4. That in any isolated locality where an extensive and prolific fishery exists the Government should erect, or assist in the erection and maintenance of a fish-freezing and oil and fish fertilizer manufacturing plant.

5. That a bonus be given for the manufacture of fish fertilizer of a standard quality, and for the production of fish-oils other than whale-oil.

6. That a bonus be given for the destruction of sharks, dogfish, and other enemies of the market fish on the regular fishing-grounds.

7. That every possible facility be given by the Government for the conveyance of fresh fish by the most suitable trains from the fishing-ports to the principal markets and inland.

8. That a proper system of collecting fishery statistics be adopted.

9. That fishermen be encouraged and assisted to use the most up-to-date methods of catching fish.

10. That the Government persevere with the introduction of the Atlantic salmon and also other useful fresh-water and sea fishes.

11. That a biological examination of our rivers and lakes be made by encouraging and assisting professors and students from the Universities to undertake a section each vacation, in order to acquire a knowledge of the biological conditions, with a view to the introduction of other species of fish or insects if considered advisable.

Taking these recommendations seriatim, I wish to give the following information with regard to each, viz.:—

1. The importance of the fisheries as an industry demands that they should be administered by a separate department, for I am convinced that no proper system of organization and development can be planned and put into effect as long as its affairs are mixed up with the business of another department. The staff, to begin with, need only be a modest one—at headquarters, a Secretary or Director, who would also be Chief Inspector, a clerk, and a typist would be sufficient. Three permanent Assistant Inspectors would be required for the North Island and three for the South Island. The services of police officers, and paid as at present, could be made use of at certain places if necessary.

2. The scientific prospecting of the coast section by section is the first, and one of if not the most important step which requires to be taken in connection with the development of our fisheries. It has always been made a strong feature of the good work carried out annually by the fishery authorities of England, Scotland, Ireland, Canada, the United States of America, South Africa, and now it is taken up vigorously by the Australian Commonwealth with most satisfactory results.

Properly carried out, it must be of the greatest assistance to the fishermen, showing him, as it does, where certain market fishes are to be found in payable quantities, the depth of water and character of bottom, &c., and thus saving him from much disappointment, loss of time, and expense in searching for new grounds.

It will take several years to accomplish this, and in order to carry it out satisfactorily, it will be necessary to get a vessel specially fitted for the work. I do not think it is possible to pick up a suitable vessel in this country, as all the small steamers are of too light draught. A vessel suitable for all kinds of exploration work, including deep-sea trawling, should be built on the lines of the largest trawlers now in use in England and Scotland—*i.e.*, about 160 ft. in length, beam in proportion, and of deep draught. It should be fitted with a refrigerator, insulated chambers for storing market fish, storage-room for specimens, &c., laboratory room, and suitable accommodation for the scientific director and officer in charge of the expedition, and should be equipped for trawling, long-lining, &c., and all the outfit necessary for exploration work. A vessel specially built of the dimensions stated would probably cost about £12,000, but I think it is possible, at some of the large trawling-ports in England to buy a second-hand vessel of suitable dimensions for considerably less than that amount, and the inside arrangements could be altered to suit the work she was required for.

The vessel should be employed six or eight months during spring, summer, and autumn each year scientifically and practically exploring a section of the coast, and during the winter season, when market fish is scarce, she could fish for market over the section tested that year, and thus demonstrate practically in the winter season the value of each section as a payable fishing-ground, and also demonstrate the possibility of a vessel of this class catching fish at this season in payable quantities. By working in this way each section of the coast would in time be scientifically and also practically tested

by trawling, lining, and other means, and its value as a payable fishing-ground proved; and the vessel would have an opportunity each year of earning part, if not the whole, of the cost of her upkeep, and also assist in supplying the market with fish at the season when it is scarcest and most in demand.

I do not think that there is any necessity for obtaining the service of a marine biological expert from another country, as I think we should utilize the services of our own scientists and students in carrying out the work. This would not only save a considerable amount, but would also develop interest in marine biological work amongst our Professors and University students.

The experimental trawling expeditions of the "Doto" in 1900 and 1901 and the "Nora Niven" in 1907 and 1908 did valuable work, but neither vessel was at all suitable for carrying out the work scientifically; and what was attempted was more in the way of making a "flying survey" of the coastal fisheries, and an attempt at discovering offshore banks. Although carried out in this way, several valuable fishing-grounds were discovered and much valuable knowledge acquired of the coastal waters.

3. There are a considerable number of fishermen throughout the Dominion who do not own their own boats, but obtain them either by hire or on time payment, generally from some of the fish-merchants; and in most cases the fish caught are sold to the merchant who owns the boat. These fishermen are thus dependent on the merchant for his boat, for which he pays a fairly high rent or rate of interest, and for a market for his fish. I have frequently been told by fishermen that the energetic man who owns his boat can do very well, but as a rule the man who leases a boat or has it on time payment very seldom "gets out of the bit." The system is a very unsatisfactory one for the fisherman, and there are instances where good fishermen, not being able to make any progress, have had to abandon fishing and take to other occupations.

I would recommend that the Government advance money to fishermen for the purchase of suitable boats in a similar way to that which the Fisheries Boards of Scotland and Ireland have been doing for some years. Although the Fisheries Board of Scotland have lately discontinued advancing money for this purpose, it is still in force in Ireland; and from the information supplied by that Board, and which is forwarded with this report, it would seem that the system is working satisfactorily. The security taken for the repayment of the loans would be in this country, as in Scotland and Ireland, largely personal; but by advancing only to fishermen of good character and ability, and besides the security of the boat make it necessary that one guarantor should be provided, I think there would be very little risk of loss by the Department. Fishermen would thus be able to procure their boats on much easier terms, they would be encouraged to go in for a better class of vessel, and they would be free to sell their fish in the best market. There is no doubt but that it would mean a considerable increase in the number of fishermen, and, as a natural consequence, in the quantity of fish brought in.

I would also recommend that the Government should supply benzene and lubricating-oil to fishermen at an increase in cost price sufficient to pay transport and handling expenses. This would mean a very large saving to fishermen, and they would, as necessary, be able to go farther afield for their fish, and be encouraged in trying new grounds. Arrangements might be made for supplies to be delivered through the Customs at each port. As fishermen have to pay cash for these necessaries, there would be no risk of loss, and it would be the greatest help and encouragement to every fisherman in the Dominion.

4. One of the most extensive and prolific fisheries in New Zealand waters is that in Foveaux Strait and round Stewart Island; and I do not know of any fishery capable of such development and of such benefit to so large a section of the population of the country as this one is. In its waters are to be found over a dozen varieties of our best market fishes, and only one of these has been caught to any extent. As things have been up to the present there has been very little outlet for any of the other kinds; so that practically as far as fish (other than blue-cod) is concerned this may be considered virgin fishing-ground. The reasons assigned for the neglect in the development of this fishery are as follows, viz.: (1) Want of proper transport facilities from the Island to the Bluff; (2) lack of proper railway facilities for the quick transport of fish from Bluff to Dunedin, Christchurch, and other markets; (3) want of a freezing plant at Stewart Island to preserve the fish caught.

As things are at present, with only a weekly steamer service, fishermen, even in favourable weather, can only fish about two days a week, in order to ensure their fish arriving at Bluff in good condition, and should the weather be unfavourable the two days before the steamer day, they lose the whole week; and I am assured that it is not an infrequent occurrence for the steamer to miss a day, and when this occurs, the fish, owing to the want of cool storage, are lost. It will thus be seen that as things are fishermen who are dependent on getting their fish away by the weekly steamer can at the most fish only two days a week, whereas with cool storage they could fish full time, and save every fish they caught, even if the steamer failed to come for several days. The quantity of fish caught would, on an average, be more than double what it is now, and the fishermen's earnings would be largely increased.

I am convinced that a fish-freezing, oil, and fertilizer-manufacturing plant erected at Half-moon Bay would immediately result in a very large increase in the quantity of fish caught and sent from the Foveaux Strait and Stewart Island fishing-grounds; and also that the works can be made to more than pay interest on the cost of construction, depreciation, and working-expenses. The cost of a freezing and ice-making plant suitable for this fishery would not exceed £4,000, and the cost of oil-extraction and fertilizer-manufacturing plant would probably amount to another £500, making a total of £4,500 for the plant required, and working-expenses, interest, and depreciation would amount to about £600.

According to the report received from Stewart Island, the quantity of fish on which wharf dues was collected for the twelve months ended the 31st December, 1912, was 650,000 lb., so that even allowing for no increase in the quantity handled during the first twelve months, the

revenue from cool-storage charges at the usual rate of ½d. a pound would amount to £810, equal to a profit of £210 over working-expenses, interest, &c.; and there is no doubt that if properly worked the fish-oil and fertilizer plants would also be worked at a profit. The most important consideration, however, would be that this large fishery would be put on a solid footing with regard to its development, which would mean an important increase in the food-supply for a large section of the population and for export, and an increase in the number of people employed in the industry and in their earnings. I would therefore recommend that the Government should erect cool-storage and fish fertilizer works at Half-moon Bay, and when the success of these works has been demonstrated the erection of similar works in other suitable localities should be taken in hand.

5. The utilization of waste products is one of the remarkable features of the manufacturing world to-day, and in Europe, England, Canada, and United States of America a great deal of attention is now given to the question of turning to account the waste material and by-products yielded by the fish business. Along with the development of our fisheries should go the establishment of fish-oil and fish fertilizer factories, for which I consider there are important possibilities in this country. Besides utilizing the offal and waste fish from the fish-cleaning sheds, which in the large centres amounts to a considerable quantity, fishermen would find a payable market for all sharks, dogfish, and other coarse fish they could catch, and this would yield an important increase to their earnings, and at the same time rid the fishing-grounds of these enemies to our market fishes.

When in England three years ago I visited the large fish-oil and fertilizer-manufacturing works on the Humber. Two separate companies had erected factories, and were competing for the fish-offal and coarse fish from the Grimsby and Hull fish-markets. The price paid for the raw material at the time of my visit was 18s. 6d. a ton. Reporting on this question a few years ago, I recommended that the Government should give a bonus per ton for fertilizer of a standard analysis and also for the production of fish-oil. I am convinced that this is necessary in order to give the industry a start, and assist in getting it placed on a solid footing. The product from these factories is required in this country, the fertilizer by the farmer, and the oil in connection with certain industries.

In order to cope with the shark and dogfish plague on some of the principal fishing-grounds on the Atlantic coast of Canada, the Fisheries Department has erected fish-reduction works, where all the coarse fish brought in by fishermen are treated. These works have paid interest on the cost of erection, depreciation, and working-expenses, and the fishing-grounds have greatly improved as regards the supply of market fish.

6. In all animal-life nature arranges wisely the proper balance of the species; but whenever an unnatural agency is introduced which assists in the destruction of one or more of the species, the natural enemies of these at once gain the ascendency, and the two together quickly reduce the number, and in time may even exterminate the species affected; and even should this unnatural agency be removed before extermination takes place, the natural enemies having gained the ascendency are likely to maintain it for a considerable time. This principle has, I think, been clearly demonstrated with regard to some of the inshore fishing-grounds. On the arrival of the first settlers, our best market fishes were found in abundance everywhere. Catching for market has now been carried on vigorously on certain grounds for over fifty years, and in all that time the enemies of the market fish, in the form of sharks, &c., have been left alone. The balance of nature has thus been disturbed by the agency of man, and the result of this has been a reduction in the quantity of market fish on these grounds, and a predominance in the number of the enemies of these fish. Had a proportionate number of the enemies been killed off it is questionable whether the quantity of market fish taken by man's agency would have affected the supply to any great extent.

Sharks and dogfish have been very plentiful on many of the fishing-grounds of late years, and besides taking great quantities of our market fishes, have in other ways proved a great nuisance to fishermen; and I have no doubt that killing them off would soon result in an increase in the quantity of market fish on these grounds.

Whenever fish-oil and fertilizer factories are established there should be no necessity to give a bonus for the destruction of sharks, dogfish, and other enemies, as fishermen would find a ready market for them at these factories; but where no such factories exist, I think fishermen should be encouraged to kill them off.

7. Fresh fish being one of the most perishable of food products, one of the most important things required to ensure a plentiful supply being placed before the people in good condition is providing the quickest possible transport facilities from the fishing ports to the markets and distribution inland. Without this it is impossible to utilize to the best advantages the fish brought in by our fishermen. The transport of fresh fish by rail has a most important bearing on the development of the industry, and ensures the people of the Dominion getting a supply of this important food in the best possible condition. In England, as necessary, special vans and trains are provided. In Scotland special trains are run. In Ireland fair facilities are given by railway companies. In Canada cold-storage cars arranged from certain points, and *one-third of freight on inland consignments is paid by the Fisheries Department.* In South Africa fish is carried at a very much lower rate than other foodstuffs. In Victoria certain facilities are granted by railways, but they are not considered satisfactory. In New South Wales fish is forwarded by both passenger and freight trains. Half ordinary parcel rates is charged by passenger-trains, and 3d. per ton per mile for quantities of 2 cwt. and over, with a minimum of 1s. to be applied when cheaper than half parcel rates. In Queensland no special facilities; forwarded mostly by passenger-trains. In South Australia the railways carry fish in "louvre" vans at half-rates, attached to passenger-trains.

8. It is very necessary that a system of collecting fishery statistics suitable for this country should be planned and put into force as soon as possible. Attached to this report will be found information supplied by the fishery authorities in England, Scotland Ireland, Canada, South Africa, and the

Australian States with regard to the system of collecting statistics in force in these countries. The most complete system seems to be that supplied by the Fisheries Board of Scotland, which is fully explained in a memorandum which is forwarded along with the statistics forms sent. The information in this connection obtained from these countries will be most helpful in planning a system suitable for this country.

9. The more up to date the methods employed by fishermen are, the more fish he will catch, the higher will his earnings be, and the public will have a more plentiful and regular supply of fish. Trawling has undoubtedly largely increased the fish-supply, and we hope to see a considerable increase in this system of fishing as new grounds are opened up. Trawling is not, however, the only means of capturing fish on a large scale; there are others which might be employed with advantage in this country, and assist in largely increasing the fish-supply. The methods I refer principally to are purse-seining, long-lining, and trammel and drift netting.

The purse seine can be used for taking our pelagic forms of market fishes as well as other kinds, and can be worked on almost any grounds. It is used extensively by the Danish and other fishermen in the North Sea, and on a very large scale by the American fishermen on the Atlantic coast for taking a variety of fishes, and is the principal means employed on the mackerel-fishing grounds. It was introduced into Japan about thirty years ago. Hundreds of these nets are now in use on the southern coast of Japan, where it is used in catching almost all kinds of fish, including sardines and herrings.

Long-line fishing is now being successfully practised by a few fishermen in the Hauraki Gulf and Cook Strait, and I have no doubt but that in a few years it will be in pretty general use on the extensive line-fishing grounds that exist round our coasts.

The objection raised by fishermen a few years ago to long-lining was that sharks were too plentiful, and would take away all the lines. The experience of the few who are now using long lines does not bear this out. Australian fishermen have lately taken to long-lining with satisfactory results, and this system is rapidly extending round the coast of New South Wales.

Of the 4,330 miles which comprises the coast-line of the North, South, and Stewart Islands, I think it is safe to say that quite two-thirds is rocky and weedy, so that we must expect that a very large percentage of our fish-supply must always come from the varieties of fish which inhabit the rock and weed areas of our coast-line. It is therefore important that a good deal of attention should be given to the improvement of the methods of catching fish on these grounds. Besides long-lining, I would also recommend the use of the trammel net, which is used effectively in other countries, and its use, I am convinced, would largely increase the take of fish.

The outfit of the exploration vessel should include a purse-seine, long-line, and trammel-net outfit, and demonstrations in the use of these should be given when working near any of the fishing-ports, fishermen being invited to accompany the vessel for the purpose of acquiring a knowledge of the construction and use of any new gear used.

Molluscs.

Very few countries in the world possess such extensive and prolific natural oyster-beds as New Zealand does, and certainly no country in the Southern Hemisphere can compare with it in this respect. In the north we have extensive rock-oyster beds, and in the south the splendid dredge-oyster beds in Foveaux Strait. Thirty years ago the rock-oyster beds extended from the Bay of Plenty to the North Cape on the east coast—*i.e.*, all the sheltered rocky foreshore along this extent of coast-line was covered with oysters; and on the west coast, in all the estuaries from Cape Maria van Diemen to Kawhia.

The supply of these oysters was considered at one time to be inexhaustible, but indiscriminate waste caused by the system of picking employed soon showed that this idea was a false one, and in time section after section of the coast had to be closed in order to allow the beds to recuperate.

When I made my first fish inspection of the rock-oyster beds in 1900 I realized that in order to prevent their depletion quite a different system of picking would have to be adopted. Leasing in small areas was at first proposed, but there were several objections to this, and I recommended that the Department should undertake the picking and wholesale marketing. There was some delay in giving effect to this system, and it was not until 1908 that it was adopted. From the commencement it has proved a great success; there has been a steady improvement in the beds everywhere; section after section of the foreshore which was depleted under the old system of licensed picking has again become productive, and in a very short time the whole of the one-time oyster-producing foreshore in the Hauraki Gulf will once more produce oysters in abundance. While the most important feature of this system of picking is the conservation of the beds, yet at the same time it allows oysters to be sold wholesale at a reasonable price, and also yields the Department a substantial annual profit.

There are still great possibilities for extending the rock-oyster beds along the coast from Bay of Plenty to the North Cape, by replanting and better protection. The increasing demand for oysters makes it necessary that this work should be steadily persevered with by the Department. It is work which is profitable in every sense of the word, as it provides a considerable amount of employment, increases the supply of a necessary food, and cannot fail to yield a profit to the Department.

Foveaux Strait Oyster-beds.

Oysters were discovered in Foveaux Strait about 1870, and since then the beds have been dredged year after year. In 1906 the Marine Department had a survey made of the beds. Mr. R. Hunter, who was in charge of the work, says in his report to the Department, "We found the beds extending eleven miles W.S.W. from Waipapapa Point to ten miles E.S.E. from Centre Island (with broken intervals between), a distance of twenty-five miles." Mr. Hunter located twelve beds, ranging in size from half a mile to two miles in width, the depth of the water varying from 12 to 20 fathoms.

During the last twenty years immense quantities of oysters have been taken from these beds, and there has of late years been a large increasing demand both for local consumption and for export, and it must be expected that this demand will continue to increase. The total quantity taken from these beds last season was 1,575,886 dozen. Of this quantity, 372,649 dozen was exported, and the balance (1,143,237 dozen) was used in New Zealand. The total value of the oysters taken is estimated at £10,641.

These beds are a valuable asset to the Dominion, and form a very important section of our sea-fisheries, and it is most important that they should be conserved and worked to the best advantage for the people of the Dominion; and all sentiment and personal considerations must be put aside when it is a question of dealing with this or any other of the Dominion's assets. Until recently it was thought that the supply of oysters on these beds was practically inexhaustible, but during the last two years there has been clear indications that they have been thinned out on some of the beds which have been worked constantly for a number of years. In speaking to some of the oyster-dredgers about the condition of these beds they said certain beds were "worked out." Mr. Hunter, in his report of the 8th May, uses the term "thinned out." The point, however, is that it is possible to deplete these beds by overdredging. With the rock-oyster beds a person can see their condition, but with the dredge-oyster beds their condition can only be determined by the quantity and quality of oysters dredged up.

The dredging and marketing of oysters from these beds is done by the fish and oyster merchants at Bluff, who own the oystering-vessels and employ men (who are paid a certain price per 100 dozen) to dredge and bring the oysters in. No special oyster license fee or royalty is paid, and they are under no restrictions as to the locality worked or quantity of oysters taken, &c.

Taking everything into consideration in connection with these oyster-beds, I am convinced that the Government should undertake the dredging and marketing in a similar way to that which is being done with the Auckland rock-oysters. By doing this the conservation of the beds from now on would be assured, and the Government would derive a considerable revenue, which would assist in defraying the cost of developing other sections of the fisheries; and I recommend that this should be done at once.

Toheroas.

As this shell-fish becomes known its popularity as an article of diet increases. In the districts in the north where it is plentiful it is in great demand.

Two toheroa-canneries are now operating at a point about half-way between Maunganui Bluff and Kaipara North Head. Extensive toheroa-beds exist along this range of coast, and also from Kaipara South Head south as far as the sandy beach, and sandhill formation extends along the coast. Toheroas are also said to exist in large quantities along the Seventy-mile Beach north of Ahipara. They are also found in the South Island, where well-stocked beds have been discovered quite recently.

Mussels.

A good deal of attention is now being given to mussels, both fresh and canned, as an article of diet. On the Coromandel coast bottling for the local market has been carried on for some years, and lately an up-to-date cannery has been started in the Town of Coromandel, the output from which is reported to meet with ready sale. Inquiries have recently been received from Australia regarding the quantity of mussels available for canning purposes, and as this bivalve is found in abundance round the New Zealand coast, there is every probability of an important trade being developed.

Fishery Laws and Regulations.

Every country has its fishery laws and regulations necessary for the administration, control, and conservation of its fisheries. It will be seen by the *résumé* forwarded with this report that in the countries referred to the authorities have very extensive powers given them under their Fisheries Acts for regulating and controlling the fisheries.

To be effective, all fishery laws and regulations should be based on a thorough knowledge of the conditions obtaining in each locality and of the life habits of the fishes dealt with. The study of the life habits of our fishes at the Marine Station at Portobello and the biological survey of our coastal waters as recommended in this report will be of greatest assistance in teaching us what conservation laws are really necessary. As time has gone on there has been many changes in connection with fishery questions, and we have become better acquainted with the habits of our fishes and the conditions obtaining on our fishing-grounds. In view of this, I think it is advisable that a careful revision of our fishery laws and regulations should be made in order to see what alterations may be necessary in the interests of the industry.

Fish-markets.

Well constructed and arranged fish-markets are much required in the principal centres, and would be a boon to the fisherman, the public, and the retailer, and for these and sanitary reasons the municipal authorities of the principal cities should construct them.

At Dunedin the only wholesale fish-market is on a platform in the railway station-yard. At Christchurch there is a private wholesale market. At Wellington there is a retail municipal market, and a wholesale market on the premises of one of the auctioneering firms. At Auckland there is no wholesale market, and fishermen have to sell their fish drectly to the fish-merchants.

In going through the replies received from the various countries, it appears that all the municipal markets are for wholesale purposes only. The idea that one central wholesale and retail market will serve the whole population of a city is, of course, a mistake, as any market or shop will only serve the

public within a certain radius. The statement which has been made that the retail man is just as necessary in the fish trade as in any other line of business is a correct one. The retail shops are necessary for the distribution of fish through all parts of the cities.

I think, however, that all public fish-markets in this country should be both for wholesale and retail purposes. The fish should be sold by auction in the morning and any other time, as necessary, during the day; and any one should be allowed to retail to the public who wishes to buy at the market.

Fresh-water Fisheries.

The interests of the sea and fresh-water fisheries are closely allied; in fact, they may be said to be inseparable; therefore, the Department (or Division) of Fisheries should include both. To have these fisheries worked skilfully and economically, this is absolutely necessary. This principle is recognized by every country in Europe, and in England, Canada, United States of America, Cape of Good Hope, and all the Australian States.

The confusion and waste which characterizes the condition of the fresh-water fisheries of this country to-day is, I consider, due to the multiplicity of control which has prevailed up to the present time, and to the want of a good practical knowledge of fishery matters on the part of those controlling the working of some of the trout-fisheries. On the other hand, I maintain that all this would have been avoided had they been administered and worked under one head, with a skilled ichthyologist in charge of the fresh-water section.

New Zealand, however, holds a peculiar position with regard to these fisheries, owing to the fact that all the trout and other fish which make these fisheries of any value have been acclimatized; and the sporting interest, which is represented by the acclimatization societies, and which, with assistance from Provinical Councils and the Government, have in the past done such valuable work in the acclimatization of useful fishes, deserves every praise and consideration when any changes in the working of these fisheries is proposed.

As time has gone on, great changes have, however, taken place with regard to acclimatization matters and our trout-fisheries. I have had special opportunities of observing and studying the work done by the acclimatization societies from one end of the country to the other, and I give them the highest praise for the splendid work they have achieved in the past; but I have to say, with all due respect, that at the present time they are merely fulfilling the functions of fishing and shooting clubs; the acclimatization of new fish seems to be lost sight of, notwithstanding the great amount of valuable work which yet remains to be done. The sporting interests are very important, and must be carefully guarded; yet I am convinced that this can be done, and at the same time allow lake and sea trout to be marketed under certain restrictions. The rivers and streams should be strictly reserved for sport, and no netting should be allowed within at least a mile radius of the mouth of any trout river or stream.

I will now show where a great annual waste of splendid table fish has taken place in connection with certain fisheries for a good number of years, and where these fisheries would have benefited by the fish being taken for market. The sea-trout which now inhabit our coastal waters in immense quantities should be freely made use of for market purposes. The thousands of tons of these fish which exist off the coasts of Canterbury, Otago, and Southland have undoubtedly an important influence on the supply of flounders and other inshore market fishes in certain localities; and if for no other reason, it is only fair that what the public lose in flounders and other fish owing to the predaceous habits of these trout should be made up by the use of these fish themselves. Further, the large lakes in the South Island are also heavily stocked with brown trout, and, as in our lakes these fish are of no sporting value, they at present fulfil no useful purpose. There is no reason why the large fish should not be taken for market. There would be no fear of depleting the lakes of trout, for the stock would be kept up by the millions of young fish which are hatched annually in the streams which feed the lakes. Then, again, the lakes in the Rotorua district have been overstocked with rainbow trout for a good many years. Since 1906 hundreds of tons of trout of the best quality could have been taken out, and would have been a welcome addition to the food-supply of the people, and the fishery would have been kept in a healthy condition by the thinning-out, yet, notwithstanding a warning given by me in 1907 with regard to the danger of overstocking, the authorities controlling the fishery persisted in a policy of overprotection. The result of the working of that fishery since 1906 has been one of tremendous waste and disappointment, and any improvement in the system of working now is due to the inspection and advice given in reports supplied by me in 1910 and 1912.

The utilization of the sea and lake trout would add largely to our fish-supply. It can be done without risk to the sporting interests, and, if skilfully handled, would result in an improvement in the quality of the fish in the lakes.

With regard to the acclimatization of other valuable fishes apart from what has already been accomplished, there is still an immense amount of profitable work to be done; in fact, I am convinced that up to the present we have not half solved the problem of the possibilities of useful acclimatization work, both with regard to the acclimatization of fresh-water and sea fishes. I would strongly recommend continuing the importation of the Atlantic salmon for another three years. As stated in previous reports, the success with the quinnat salmon was, I consider, due principally to the systematic effort made, and it was on the same lines that I recommended making an effort to establish the Atlantic salmon in the Waiau River. Unfortunately, this has not been carried out, and there has now been a break of three years since the last importation was made. Other valuable fish would be the landlocked salmon (*Salmo sebago*) of Canada and the United States of America, or the *Venner lax*, the landlocked salmon of Sweden and Norway; the *Salmo carpio*, of the North Italian lakes; and the deep-

water trout (*Salmo tahoensis*) of Lake Tahoe and other mountain lakes and streams in the Sierra Nevada Mountains; the Truckee trout (*Salmo henshawii*); the cut-throat trout (*Salmo clarkii*); and the Rio Grande trout (*Salmo spilurus*). All these inhabit mountain lakes and streams, and we have a vast extent of suitable water in our mountain regions where they should do well.

With regard to the acclimatization of sea-fish, the perseverance and extension of the excellent work at the Portobello Marine Station is to be recommended. I have previously recommended the introduction of the striped bass from America (*Roccus lineatus*), as I consider it one of the most desirable inshore sea-fish which can be introduced.

Money judiciously spent on the introduction of useful fishes will always be a good investment for the country. I do not think, however, there is any necessity for this money to come out of the general taxpayers' pocket; it should come from the revenue derived from trout-angling licenses.

If the Government is prepared to put the fisheries under the control of a skilled ichthyologist, I would recommend that it should take over all the work now being done by the acclimatization societies. Under skilled management I am convinced that, from the total revenue derived from angling licenses throughout the Dominion, it is possible to do all the trout-hatching and river-protection work necessary, and have a surplus sufficient to defray the cost of an annual importation of some of the fishes mentioned. This, I am convinced, is the proper way to carry on the acclimatization of new fishes, and under skilled management it can be done.

A good many acclimatization societies are now more or less exercised about the decrease and general deterioration of trout in their rivers and streams. With regard to this, it must be remembered that every stream has a limited permanent carrying-capacity. When trout were first introduced the rivers and streams contained an abnormal quantity of natural food, which accounted for the large size and quantity of fish carried by most of our streams for a time. As the natural feed decreased, the size and quantity of trout went down in proportion, and to-day in a good many of the streams which only yield small baskets as compared with what could be taken some years ago, it is possible that the number of fish is in proportion to the quantity of food available, so that in order to effect an improvement in the size and quantity of trout it would be necessary to introduce some new natural feed. A biological examination of our rivers and lakes and an analysis of the water of the rivers in each district would be of great interest and value in connection with fish-life generally, and the introduction of natural feed suitable for certain waters; and I would recommend that the Professors and students from our Universities be encouraged to take up this matter and devote some time to it during each vacation.

Another matter which would have an important bearing on the effective and economical working of fish hatching and rearing establishments is the training of fish-culturists. In the United States of America, before a man is qualified to take charge of a hatchery, he has to serve for a time under a qualified fish-culturist, and pass certain examinations in fish-cultural work, embryology, &c. The result is that all the fish-culturists in charge of stations are properly qualified, and the work is carried out on the most practical and scientific lines. In this country any one who may have seen the inside of a fish-hatchery for a season, or who has assisted for a few months netting trout for stripping, or served for a time as a ranger for an acclimatization society or Government Department, calls himself a "fish-culturist," and it is quite common to find such men in charge of fish-hatcheries or in control of certain fish-work. The result is that the work is carried out in a haphazard and wasteful manner, causing much disappointment and waste of time and money. Of the men employed in fish-culture in New Zealand to-day, there are not more than four at the most who can describe scientifically the impregnation of a fish-egg or its embryology from impregnation to hatching out. The trained expert knows he will get certain results, but the amateur can only guess and experiment.

New Zealand's fresh-water fisheries at the present time are of very great importance, as providing a healthy and necessary sport for our own people and as an attraction for the foreign sporting tourist; and by the utilization of trout from our lakes and the introduction of other valuable lake fish they can also be made to add materially to the fish-supply required for market.

With regard to these fisheries as a sporting attraction, I certainly think a great deal more should be done to improve the fishing in our mountain regions, and this can be done by the introduction of certain lake sport fish and trout suitable for mountain rivers and streams. By the introduction of some of the fish I have mentioned in this report, it is possible in the Waiau watershed in Southland to develop the finest sporting fishing in the Dominion, and there are many similar mountain rivers and streams both on the east and west sides of the Southern Alps suitable for these fish, and their introduction would no doubt open up new routes for sportsmen.

Conclusion.

In conclusion, I wish to emphasize what I have already stated in this report—that up to the present the New Zealand fishing industry has not been given anything like the attention its importance demands—as one of the most important food-supplies for its people, as a source of employment, and as an industry capable of developing an important export trade, &c.

I feel confident that if carried out the recommendations I have made will result in the fishing industry being put on a sound footing with regard to its organization and development, but, as with all other industries, a considerable amount of money is required at first. To carry out what I have recommended would, I estimate, take about £25,000 the first year. This would include the cost of a suitable vessel for exploration work, vessels and plant required for working the Foveaux Strait oyster-beds, freezing-works for Stewart Island, and cost of administering the fisheries. Quite three parts of this amount, however, would be for vessels and plant, which would be an asset. No further expenditure should be required in this direction the following year; all that would be required would be the cost of upkeep and administration.

The net profit on the sale of the rock-oysters last season was £1,146 17s. 2d., and from the improved condition of the beds it is reasonable to expect a substantial increase on that amount this season—an amount which would be equal to 5 per cent. on the £25,000 required; and if the Government act on my recommendation to work the Foveaux Strait oyster-beds, a much larger profit should be derived from them than from the rock-oysters, so that from the start the fisheries will pay good interest on the money expended on building up this valuable industry.

I do not think the Government should take up regular fishing for market, but should confine itself to opening up the fishing-grounds and assisting fishermen in every reasonable way. This will result in a large increase in the number of fishermen, which will give the desired result—viz., a large and more regular supply of fish being brought in.

The following is a *résumé* of the replies received to my letters of the 29th November, 1912, addressed to the authorities controlling the fishing industry:—

1. How are the fisheries administered—whether by a department, a Fisheries Board, or by Fishery Commissioners?

England.—Board of Trade; transferred to the Board of Agriculture and Fisheries, 1903.
Scotland.—Fishery Board of Scotland.
Ireland.—Sea-fisheries, Department of Agriculture, &c.; fresh-water fisheries, Boards of Conservators.
Canada.—Department of Marine and Fisheries, Ottawa.
Victoria.—Department of Fisheries and Game.
New South Wales.—Chief Secretary's Department.
Queensland.—The Marine Board of Queensland.
South Australia.—Fisheries Department.
Western Australia.—Department under control of Colonial Secretary.

2. What staff of officers are employed in connection with the fisheries—(*a*) at the Head Office, (*b*) in connection with scientific-research work, (*c*) at the various fishing-ports and fish-markets, and (*d*) in connection with the trout and other fresh-water fisheries?

England.—Administrative Branch, 30 clerks. Research—Naturalist, Junior Assistant, Laboratory Assistant, skipper and crew of research steamer; collectors of fishery statistics, &c., 170; officers employed by local bodies.
Scotland.—Secretary, 6 clerks, 2 typists, and 2 messengers, and 2 extra clerks proposed; also, General Inspector of Sea Fisheries, Marine Superintendent, and Inspector of Salmon Fisheries (3 officers). The Fishery Board employ a fleet of 5 cruisers to enforce regulations, with complement of 5 masters, 10 officers, 10 engineers, and 69 men.
Ireland.—Inspectors and clerks, 16; Scientific Adviser, 1; assistants, 2; Hydrographer, 1; typiste, 1; master of vessel, 1.
Canada.—1 Superintendent of Fisheries, 1 Commissioner of Fisheries (scientific), 21 permanent clerks. Scientific research—A biological Board consisting of the Commissioner of Fisheries and mainly Professors from various Universities. In the outside service about 900 officers employed as fishery overseers at very small salaries, but results not considered satisfactory, and reorganization under consideration.
Victoria.—Chief Inspector and 4 staff, 4 travelling Inspectors. No scientific officer, but a large number of honorary Inspectors.
New South Wales.—(*a*) 8 clerks, 1 draughtsman and surveyor, 3 draughtsmen, 1 supervising Inspector; (*b*) and (*d*) 1 Superintendent of Fishery Investigation, 1 clerk, 1 attendant, 2 Inspectors, 2 caretakers (also assist in other matters of fishery); (*c*) 30 Inspectors.
Queensland.—(*a*) Officers of the Marine Board (number not given); (*b*) no scientific officer; (*c*) and (*d*) Inspectors at outports, but no information given as to number employed.
South Australia.—(*a*) Chief Inspector, Senior Inspector (fish), Senior Inspector (oysters), 3 Inspectors; (*b*) no scientific officer; (*c*) and (*d*) 23 Inspectors and all police officers *ex officio*.
Western Australia.—(*a*) Chief Inspector of Fisheries and staff of secretary and 5 clerks and messenger (Aboriginal Department combined).

3. Please forward a copy of your Fishery Acts and Regulations, and also be good enough to state whether there are any special protective laws in force—(*a*) with regard to closing any areas to fishing round any part of the coast, (*b*) fixing a minimum size-limit at which certain fish may be taken and marketed, and (*c*) prohibiting the use of certain nets in any locality, and also limiting the size of mesh of nets used in certain kinds of fishing?

England.—With the exception of certain provisions with regard to oysters, crabs, and lobsters, there are no specific statutory enactments with respect to closed areas in English or Welsh waters, or specifying the minimum sizes—(1) at which fish may be taken, (2) of the mesh of nets. These matters can, however, be dealt with by by-law. Copies of the by-laws in operation are enclosed.
Scotland.—(*a.*) Under the various sea-fishery statutes the Fishery Board have very extensive powers, both of regulating and prohibiting fishing. The Sea Fisheries Act, 1885, section 4, empowers them to make by-laws for restricting or prohibiting any method of sea-fishing within the exclusive fishing-limits of Scotland where they are satisfied such method is injurious. They are also empowered to prohibit trawling within certain areas, and, if considered advisable, out to a distance of thirteen miles off the coast, if

approved by the European countries interested in the North Sea fisheries. Have also power to restrict daylight or Sunday fishing for herrings on the west coast of Scotland. (*b.*) The only Act in force limiting the size at which certain fish may be taken and marketed is the Oyster, Crab, and Lobster Fisheries Act, 1877. The regulation size for these is specified and enforced. (*c.*) The only specific restriction is with regard to herring-nets.

Ireland.—(*a.*) The protective laws are of two kinds, namely: those passed directly by Parliament, and those made by the Department under the powers which are mainly conferred by section 91 of the Act 5 and 6 Victoria, cap. 106. The Department have exercised their power extensively, as will be seen from the accompanying pamphlets, which contain the substance of the regulations made by the Department.

Canada.—Under the Fisheries Act regulations can and are made for the different provinces. Certain areas are set aside in some of the provinces for the natural propagation of fish, and minimum sizes are established in certain instances, and the size of mesh is controlled in practically all the inland fisheries, as well as in the salmon-fisheries.

Victoria.—(*a.*) Power is given by Fisheries Act to close any area to fishing in any part of the coast within the three-mile limit. (*b.*) We have a minimum size-limit at which most species of fish may be taken, sold, or had in possession, &c. (*c.*) We can prohibit the use of nets in any locality, and also limit the size of mesh.

New South Wales.—(*a.*) The Fisheries Act of 1902 gives power to close the whole or any defined portion of any tidal or inland water for the purpose of protecting the spawning or feeding-grounds for immature fish. (*b.*) Section 23 provides penalties for taking, having in possession, or on his premises, or in his boat, or selling, or consigning for sale any fish or crustaceans of a less size or weight than specified in the Second Schedule of the said Act, all undersized fish to be forfeited. (*c.*) Certain kind and size of net prohibited in certain localities, and the size and mesh of nets limited. This is provided for in sections 18, 19, 20, 21, 22, and 23 of the Fisheries Act of 1902.

Queensland.—(*a.*) Netting prohibited in certain localities, and also taking of fish by any other means. (*b.*) A size-limit provided for all the principal market fish, and no person shall take, sell, or have in possession or on his premises any fish of a less size than specified in the regulations. (*c.*) Yes, certain nets prohibited in certain localities and size of net and mesh of nets specified.

South Australia.—(*a.*) Fisheries Act gives unlimited powers in this respect. (*b.*) A size-limit provided for all the principal market fish. (*c.*) Fisheries Act provides for closing any locality and also limiting the size of mesh of nets.

Western Australia.—(*a.*) Power exists under the Fisheries Act to close any waters against the use of nets or any other method of fishing. Annually certain waters are closed against the use of nets. Ova-bearing crayfish are not allowed to be taken during certain months. (*b.*) A size-limit is provided for certain fish. (*c.*) Fisheries Acts provide for this.

4. What fishery-encouragement laws are in force—(*a*) as regards giving financial assistance to fishermen, (*b*) prospecting and giving out information with regard to the fishing-grounds, (*c*) providing instruction in fish-curing or in any other branch of the industry, and (*d*) whether any bounty is given on quantities of fresh fish brought to market, fish cured or canned, or on the production of fish-oil or any other fish product?

5. If financial assistance is granted to fishermen to enable them to purchase suitable boats and fishing-gear or for any other purpose, on what terms are advances made, and how does the Department secure itself against loss?

England.—4 and 5. Nil.

Scotland.—4. (*a.*) No law in force. (*b.*), (*c.*), and (*d.*) Fishery Board disseminate news *re* herring-fishery, position of grounds, &c.; also give educational demonstrations to selected bodies of fishermen.

5. Have power to grant assistance to fishermen by advancing money for boats, &c., but results unsatisfactory and no loans made since 1891.

Ireland.—4. (*a.*) Render financial assistance to fishermen out of Department's endowment fund on personal security and on mortgage on vessels. (*b.*) and (*c.*) Give instruction in net-mending, fish-curing, &c.; do prospecting-work as funds permit.

Canada.—4. (*a.*) £32,000 has been appropriated annually for a number of years as bounty to deep-sea fishermen to encourage better class of vessel; paid in accordance with regulations. (*b.*) Monthly statistics published. (*c.*) Literature published from time to time.

5. Nil.

Victoria.—4 and 5. Nil.

New South Wales.—4 and 5. Nil.

Queensland.—4 and 5. Nil.

South Australia.—4 and 5. Nil.

Western Australia.—4 and 5. Nil, except ½d. per pound on canned fish.

6. Are all fishing-vessels registered and licensed, and what license fee is charged on the different grades of vessels employed; and are fishermen or nets licensed, and, if so, what fee is charged?

7. What facilities are provided by the Railway Department for the transport of fresh fish: (*a*) is it forwarded by passenger or goods trains; (*b*) is it carried at a lower rate than other food products, and, if so, at what rate; and (*c*) are special wagons provided for the transport of fish?

8. What system of marketing fish is adopted in the cities and principal towns, and are any of the markets erected and controlled by the Fisheries Department or municipal authorities?

England.—6. Sea-fishing boats registered; no license fee payable.
7. Special vans, and, if necessary, special trains provided.

Scotland.—6. All fishing-vessels registered.
7. Special trains run, but freight-rates considered excessive.
8. Marketing controlled by municipal or harbour authority; none by Fishery Board.

Ireland.—6. Above a certain limit must be registered; no license required.
7. Railway company give fair facilities.
8. Fish mostly exported. Dublin Corporation have market.

Canada.—6. No license required except for sea-going vessels to qualify for bounty; no charge.
7. Cold-storage cars arranged from certain points; one-third of freight to interior is paid by Department.
8. No municipal markets.

Victoria.—6. Fishing-vessels registered; fees not yet fixed.
7. Certain facilities granted by railways, but not considered satisfactory.
8. Melbourne fish-market controlled by City Council.

New South Wales.—6. All fishing-boats licensed; fee, 5s.; each fisherman likewise; no license charged for nets.
7. (*a*) and (*b*). Fish is forwarded by both passenger and freight trains. Half ordinary parcel rates charged by passenger-trains, and 3d. per ton per mile for quantities of 2 cwt. and over, with minimum of 1s. to be applied when cheaper than half parcel rates. (*c.*) Special vans provided for large quantities.
8. Sydney has a fish-market controlled by municipality, also private fish-markets just outside city boundaries. Newcastle has market controlled privately. Fish is marketed by rail or boat according to locality; packed in cases and baskets with ice.

Queensland.—6. All fishing-boats licensed and numbered; fee, £1 per annum; oyster-boats, £1 per annum up to 3 tons, and 10s. per ton over. Fishermen and oystermen licensed; fee, 10s. per annum.
7. (*a.*) No special facilities; forwarded mostly by passenger-train. (*b.*) Special charge of 6d. per case under twenty miles, small extra charge for over. Cases about 40 or 50 lb. (*c.*) Special wagons employed if necessary.
8. Brisbane has fish-markets controlled by a Board consisting of one member from each municipal division. Fish is sold by auction to the trade, &c. Inspection, marketing, and storage fees charged towards cost of running market.

South Australia.—6. All fishing-boats registered; no fee charged. Fishermen licensed; fee, 10s. per annum; servants, 5s. per annum.
7. Railways carry fish in "louvre" vans at half rates, attached to passenger-trains.
8. Fish-market in Adelaide owned by municipality, and leased to private firm, who conduct auction-sales.

Western Australia.—6. Particulars said to be given in Fisheries Act, of which no copy is on hand.

9. What system of collecting fishery statistics is adopted, and has it proved quite satisfactory?

England.—Employ 170 collectors of sea-fisheries statistics, and 6 fish-measurers at fishing-ports.

Scotland.—Coast and adjoining islands are divided into 27 fishery districts, in which there are employed a large number of officers, under supervision of Head Office. Outdoor staff consists of General Inspector, Assistant Inspector, 10 first-class officers, and 22 second-class officers. An elaborate system of collecting statistics is in vogue (explained in a memorandum and set of forms herewith).

Ireland.—Services of coast-guard availed of, and found fairly satisfactory. Forms supplied. Specimens sent.

Canada.—Local fishery officers, who are allowed to employ assistance. Forms supplied. Specimens sent.

Victoria.—No satisfactory system hitherto. New Act passed, and it is hoped returns will become satisfactory. Specimen forms sent.

New South Wales.—Local Inspectors and agents furnish weekly returns. Specimen forms sent.

Queensland.—No satisfactory system. Approximate estimate obtained from railway returns and market sales. Specimen forms sent.

South Australia.—Statistics collected by Inspectors, and returns supplied by railways, but not considered satisfactory.

Western Australia.—Collected by Inspectors, the fishermen, dealers, and Railway Department. Forms sent.

10. With regard to the acclimatization of trout or other foreign fishes—(*a*) Is it done by the Fishery Department or by the acclimatization or fishery societies; (*b*) are the fish-hatcheries erected and worked by the Department; and (*c*) what trout-fishing license fee is charged, and is it collected by the Department?

Victoria.—(*a.*) Portion done by Department and portion by acclimatization society, subsidized by Government. (*b.*) Portion done by Department and portion by acclimatization society, subsidized by Government. (*c.*) No license charged.
New South Wales.—(*a.*) and (*b.*) All done by Fisheries Department. (*c.*) No license charged.
Queensland.—Work has been abandoned, but a new society in North-west Queensland has lately imported some trout-ova through the State Agricultural Department.
South Australia.—No hatcheries being worked departmentally. No license fees.
Western Australia.—(*a.*) Acclimatization society. No hatcheries and no license charged.

11. What system of oyster preservation and cultivation is adopted ? Please give particulars with regard to oyster leases.

England.—Refer us to Oyster, Crab, and Lobster Act of 1877, sections 5, 8, 9, and 10.
Scotland.—No information given *re* oysters ; refer us to same Act as above.
Ireland.—No information.
Canada.—No information.
Victoria.—Experimenting at present.
New South Wales.—Lessees cultivate their leases by laying out shell, &c. Leases granted for average, special, and inferior lands. Minimum rent not less than £5 per annum.
Queensland.—Large areas set aside as reserves to conserve brood oysters for distribution of spat. A comprehensive system of cultivation in force ; particulars given in Oyster Act and Regulations. Copies sent.
South Australia.—Oyster-cultivation in its infancy, and experiments being conducted.
Western Australia.—Little if any cultivation of oysters is undertaken.

The following is a *résumé* of the reply received to my letter of the 29th November, 1912, addressed to the authorities controlling the fishing industry at Cape Town :—

1. How are the fisheries administered—whether directly by the Department of Agriculture or as a division of that Department ?

The fishing industry is administered by the Department of the Administrator.

2. What staff of officers are employed in connection with the fisheries—(*a*) at the Head Office, (*b*) in connection with scientific-research work (*c*) at the various fishing ports and markets, and (*d*) in connection with the salmon and other fresh-water fisheries ?

(*a.*) At headquarters the work is dealt with by the administration staff generally. A Fishery Advisory Board, consisting of seven members and a secretary, meets periodically, and submits recommendations to the Department. (*b.*) Scientific-research work is carried on at a marine biological station by Dr. Gilchrist, the Government Fisheries Advisor. (*c.*) A fisheries officer, with headquarters at Cape Town, visits the different ports and fishing-stations periodically. (*d.*) Government hatcheries are under the charge of Curator.

3. Please forward copies of the Sea Fisheries and Salmon Fisheries Acts, and also be good enough to state whether there are any special protective laws in force—(*a*) with regard to closing any areas to fishing round any part of the coasts, (*b*) fixing a minimum size-limit at which certain fishes may be taken and marketed, and (*c*) limiting the size of mesh of nets used in certain kinds of fishing ?

(*a.*) Fishing in particular areas along the coast is regulated by defining areas within which certain methods of fishing are allowed. (*b.*) Minimum size-limit for certain fish in force. (*c.*) The size of the mesh of nets is fixed by regulation.

4. What fishery encouragement laws are in force—(*a*) as regards giving financial assistance to fishermen, (*b*) prospecting and giving out information with regard to the fishing-grounds, (*c*) providing instruction in fish-curing or in any other branch of the industry, and (*d*) whether any bounty is given in connection with fish curing or canning or on the production of fish-oil or any other fish product ?

(*a.*) No direct financial assistance given to fishermen, but Government assist them by improving boat-landings, &c. (*b.*) No prospecting done at present, but a great amount of valuable fishery-exploration work was done by the Government-owned trawler "Pieter Faure" from 1897 to 1906. (*c.*) No instruction given in fish-curing. (*d.*) No bounties given on quantities of cured and canned fish, or on the production of fish-oil or any other product.

5. If loans are granted to fishermen to assist them in procuring suitable boats and gear, on what terms are the advances made, and how does the Department secure itself against loss ?

5. No advances made to fishermen to buy boats, gear, &c.

6. With regard to the construction and working of fish-markets, are they erected and controlled by the Department or by the municipal authorities in the principal cities ?

6. Fish-markets are erected and controlled by the municipal authorities.

7. What facilities are provided by the Railway authorities for the transport of fresh fish throughout the country ?

7. Fish is carried at a very much lower rate than other foodstuffs.

8. What system of collecting fishery statistics is adopted, and has it proved quite satisfactory ? Please forward some of the forms in use.

8. The collection of fishery statistics has always been a matter of great difficulty, owing to the difficulty in getting fishermen to render correct returns of the catches.

9. Does the Government own any other fishing-vessels besides the "Pieter Faure" and, if so, are they employed fishing for market in competition with privately owned vessels ; and does the "Pieter Faure," besides doing exploration work, fish for market as well ?

9. The Government does not own any fishing-vessels at present. The trawler "Pieter Faure" is no longer used as such.

10. Please supply the dimensions and engine-power of the "Pieter Faure," her equipment for fishing and exploration ?

10. Particulars not supplied.

11. Are all vessels engaged in fishing registered and licensed, and what license fee is charged ?

11. All vessels employed in fishing for market are both registered and licensed.

FISHERY BOARD FOR SCOTLAND.

MEMO. *re* STATISTICS.

Various European authorities have indicated their commendation of the model on which the Board's fishery statistics are drawn up, and also of the completeness of the information afforded.

Previous to 1885 the only returns available related to the number of persons employed in the fisheries, the number and tonnage of the boats engaged, and the quantity of fish cured and branded and exported. These statistics were collected by the Board for the whole of Great Britain from 1809 up to 1849, fishery officers being stationed at various ports for this and other purposes.

In 1849 the Board's officers in England were withdrawn, and in 1868 their connection with the Isle of Man came to an end. In 1885 an Act was passed empowering the Board to obtain returns of all fish landed, and these were first published in the annual report for 1886. They were subsequently completely remodelled (1892) and greatly amplified, and in their present form afford a very fair criterion of the actual condition of the fisheries.

The subject may be conveniently treated under three heads, viz.: (*a*) The staff employed in collecting and collating the returns; (*b*) the system of collection; and (*c*) the principle followed in abstracting and collating the statistics for the Board's annual report.

(*a.*) *Staff employed in collecting and collating Returns.*

For administrative and statistical purposes, the Scottish coast and adjacent islands are divided up into twenty-seven fishery districts (see map). These districts are administered under the supervision of the head office by an outdoor staff, consisting of a General Inspector (resident in Edinburgh), an Assistant Inspector (stationed at Inverness), ten first-class officers, and twenty-two second-class officers. In each district there is a resident officer and an office, but the district of Aberdeen is in charge of three officers, and the district of Peterhead, Fraserburgh, Wick, Shetland, and Stornoway are in charge of two officers.

These officers were first appointed in 1809, under the provisions of 48 Geo. III, c. 110, and their duties have been greatly added to from time to time by fresh legislation. The principal duties are collecting returns, preparing reports on the state of the fisheries, and on any special fishery problems or any question of public policy regarding fisheries arising in their districts, enforcement of the Acts and regulations relating to the preservation of order at sea (including lettering and numbering and lighting of fishing-boats), and Acts and by-laws regulating different methods of fishing, administering the herring-brand, testing and stamping herring-measures, and settling (in a quasi-judicial capacity) cases of damage by one fishing-boat to another or to fishing-gear. The west coast officers are now also the Registrars of fishing-boats on that coast, having taken over that duty from the Customs officers a few years ago.

All candidates for fishery officerships must possess a practical knowledge of the industry, and, with that end in view, must serve an apprenticeship as coopers and curers. If suitably recommended, the Board, on the occurrence of a vacancy, put them through the test of an examination in practical knowledge, and, if they successfully emerge from that ordeal, they are called upon by the Civil Service Commissioners to go through a limited competition in literary subjects, the candidate securing the greatest number of marks in both examinations being the one appointed.

For the purpose of obtaining returns of fish landed from the different fishing-creeks and villages, the officer is authorized to appoint local correspondents, whose names and occupations he intimates to the head office. The person usually selected is the one most closely connected with the industry, such as the harbourmaster, local fish-curer, fish-salesman, fisherman, or stationmaster.

During the currency of the great summer herring-fishery, when a larger portion of their time is occupied in examining barrels of herrings presented for the brand, the officers in charge of the principal districts are allowed to appoint temporary clerks to assist them in collecting and collating returns and in other clerical work, at a salary of not more than 18s. a week, the provision in the parliamentary vote for that purpose being, for the present financial year, £70.

In Aberdeen district, which (excluding herrings) is by far the most important fishing-centre in Scotland, the three officers are assisted by two permanent clerks. These clerks devote the whole of their time to the collection of statistics at the market, a certain portion of which is placed at the disposal of the Committee for North Sea Investigations.

Here I would wish to express my firm belief in the value of full and accurate statistics as the best aid in the solution of sea-fishery problems, provided that—(1) They are spread over a fairly long period; (2) they are collected by or under the supervision of thoroughly reliable and disinterested persons having a practical knowledge of the industry; and (3) they are analyzed by officials with an open mind, free from theories and preconceived ideas as to the conclusions to be arrived at.

(b.) *The System of Collection.*

(1.) *Means-of-capture Returns.*—These returns are classified under the heads of steamers and sailing-vessels. The former are again divided into trawlers and herring drifters and liners, and information is given as to their registered tonnage, length of keel, and value. The extent and value

of fishing-gear used on board each class of boats is also shown, while the highest number of herring-boats fishing from each district follows, as well as the number of seaworthy boats unlaunched during the year. Then follows the number of men employed on board fishing-vessels.

The officer obtains these returns chiefly during the annual survey of his district—a duty which he performs at least once a year after obtaining sanction for incurring the expense involved; usually estimated from the head office. The expense varies according to the facilities for travelling. On arrival at a fishing-village the officer usually ascertains, by personal inspection, the actual condition of those local boats which are at home, and confers with the leading fishermen, and obtains from them the information he desires as to boats (and relative gear) which may be fishing in some other district at the time, and records it in a note-book. Any changes occurring between the period of his visit and the close of the year are reported by his local correspondent. He also takes the opportunity of obtaining as much information as possible on this subject from the masters of boats whose certificates of registry he has to endorse once a year.

The information obtained during the survey is, on the officer's return to his station, embodied in a book entitled "Means-of-capture Book," which is drawn up in such a manner as to show the basis on which the total figures are arrived at. It would naturally be most difficult to give a mathematically accurate estimate of the area of nets, length of lines, and the value of the same used at each creek. In order to overcome this difficulty as far as possible, the officers fix on an average area for each net, an average length for each description of line, and an average value, reducing or increasing the latter each year after inspecting the general condition of the gear. The Inspectors pay periodical visits to each district, and confer with the officers as to any point of difficulty arising in connection with the statistical returns. At the close of each year every officer has to forward his "Means-of-capture Book," together with the annual return abstracted therefrom, to the head office for inspection, and the latter is then embodied in the annual report.

(2.) *Fish landed.*—Information as to the fish landed in Scotland embraces quantities and values of twenty-six different varieties of fish (excluding shell-fish, of which six varieties are given) landed in each district by—(1) steam trawlers, (2) steam and sailing liners, and (3) steam and sailing herring-drifters. Returns of the total annual catch landed at each fishing creek or village are also shown, together with a general statement of the fishing-grounds on which taken. Such general statement is really the only essential in the majority of cases, as the local grounds are perfectly familiar to all those interested, but, as regards trawling-ports, from which steam fishing-vessels other than trawlers also usually fish, it is necessary to secure more detailed information, as the field of operations is more extended. Thus, in the case of Aberdeen, the principal trawling-port, the Board's fishery officers and clerks endeavour to secure details from each vessel of every catch landed, the place of fishing, the depth, and the number of hours actually fishing, while, in the case of trawlers, the number of hauls made are obtained, and in the case of liners, the number of lines used. For this information the officials are entirely dependent on the skippers of vessels, the only check available being the characteristics of the fish landed, long experience having enabled those in constant touch with the market to form some idea of the ground on which boats have been fishing by the character of the catch and the appearance and quality of the fish. The Aberdeen returns also classify haddocks into extra large, large, medium and small; cod into cod and codling; lemon sole into large and small; plaice into large, medium, and small; whitches, large and small; and megrims, large and small.

In addition to the annual returns, the officers throughout the year furnish weekly reports on the fisheries of their respective districts, while during the progress of the summer herring-fishery a detailed weekly return (based on information supplied by correspondents) is submitted of the number of boats fishing daily, the daily catch, prices, fishing-grounds, and the quantity cured, branded, and exported, this information being also embodied (more concisely) in a telegram addressed to the head office every Monday for communication to the Press. Officers are also authorized to exchange wires daily as to catch, fishing-grounds, and prices, and these wires are posted up at the mart for the information of fishermen, salesmen, and curers.

Local correspondents, on their appointment, are supplied with a book in which to record the quantities and values of the different kinds of fish landed at the creek for which they are responsible.

At the end of each month each correspondent furnishes a return of the total fish landed at his station to the officer, who checks the return, as far as possible, and embodies the figures in a monthly return to the Board, which is in its turn embodied at the head office in a return for transmission to the Board of Agriculture and Fisheries, and the newspapers. The Inspectors make periodical inspection of the correspondents' books to see that they are properly kept.

At the close of the year the local officer forwards his book containing the returns of fish landed to the head office for inspection, together with an abstract therefrom for insertion in the annual report.

It may be explained here that the large-sized kinds of fish are usually sold by number, and their weight is calculated on an average of so-many fish to the hundredweight. The smaller-sized fish, on the other hand, are usually placed in boxes which are estimated to contain 1 cwt. of fish. At Aberdeen, the clerks assisting the local officers are in close attendance at the fish-market, and they take a note of the details of the catch of each vessel, together with the amount realized; while at the other trawling-ports the larger trawling companies are supplied by the officers with blank statutory forms in which they insert the figures for each month.

(3.) *Fish cured.*—Statistics of cured fish are obtained from curing-firms on statutory forms. The procedure is as follows: A person desirous of engaging in the curing of cod, ling, or herrings must in the first place (in terms of the statutes) send a formal notice of his intention to the local officer, who immediately enters his name in a book kept for the purpose, and furnishes him with a blank form in which he enters the particulars of the cod, ling, or herring cured and the manner in which treated, whether gutted or ungutted. At the end of the herring, or cod-fishing season, the figures given in the

forms are transferred to a ledger in which an account has been opened for each curer, and these are transferred again at the close of the year to an annual return for transmission, together with the relative books, to the head-office.

(4.) *Cured Fish exported.*—Similarly with regard to exportation; a curer desiring to ship his cured herrings, or cod, ling, &c., must give formal notice of his intention to the local fishery officer, and furnish him with the number of barrels and half-barrels which he means to export, the tonnage and nationality of the vessel employed, and the number of crew engaged, and the port to which the herrings, or cod, &c., are being consigned.

(5.) *Miscellaneous Returns.*—These are obtained by the local officers during their annual survey and by corresponding with the parties engaged in the subsidiary industries to the fishing industry.

In conclusion, it may be stated that, while the local correspondents receive allowances varying from only 5s. to £7, they take a keen interest in their duties, deeming it an honour to be selected to perform duties of an official nature, and consequently taking a pride in securing that the information supplied by them shall be as accurate as possible.

(c.) *Collation of the Returns.*

At the close of each year the fishery officers have to forward their returns to the head office, where the staff proceed to check them and abstract figures for the annual report. All errors discovered are noted and subsequently intimated to the officer affected.

ROTORUA AND TAUPO TROUT FISHERIES.

Wellington, 17th September, 1912.

SIR,—

As instructed by you, I have made an inspection of the Lake Taupo and Rotorua trout fisheries, and I have now the honour to supply the following report on their condition and recommendations for their future working.

TAUPO.

I first visited Lake Taupo, arriving there by coach from Rotorua on the 16th August. The following day I hired a launch from Mr. Ryan and commenced a detailed inspection of all the rivers and streams of any consequence flowing into the lake. I made an examination of the mouths of each, and going up-stream as far as time would allow in order to get as good an idea as possible of the volume and character of the water and bottom, and also of the number and size of trout which were running up at this season. At Tokaanu I hired a trap and went up the Tongariro River a considerable distance, and also inspected Chase's Creek and the Potu Stream, tributaries of the Tongariro. I am forwarding with this a lithograph map of Lake Taupo, on which I have noted a description of the size and character of each river and stream.

On the 19th and 20th I inspected the Whangamata and Whakaiapo Streams, and had an opportunity of handling a large number of trout which were being netted by the Manager of the Auckland Acclimatization Hatchery for spawning. All the streams flowing into Lake Taupo have a pumice bottom at their mouths, but some distance up a number have a shingle and rock bottom. The longest and heaviest rivers flow into the lake on the east and south sides; these take their rise from the Kaimanawa and Ahimanawa Ranges, and from the indications along their banks and from reports it would seem that they are subject to heavy floods at certain seasons. The streams on the west and north sides are smaller and shorter, and not nearly so subject to floods.

Trout.

I saw considerable numbers of spawning trout in all the streams, but they were most numerous in the Waitahanui, Hinemaiai, Tauranga-Taupo, Waimarino, Chase's Creek, Waihora, Whangamata, and Whakaiapo. No exceptionally large fish were seen in any of the streams, and I would estimate the average weight at about 6 lb. In the Whakaiapo, where I had an opportunity of handling a large number of fish, the average weight of unspawned fish would be about 5 lb. The fish were rather uneven in size in this stream, and a good many ill-conditioned fish were seen. In size and condition the fish resembled those I handled for spawning in the Ngongotaha, Utahina, and Fairy Creek in 1906. In the Whangamata the fish were more even in size, and the average weight higher and fewer ill-conditioned fish. I estimate their average weight at about 6½ lb.

I met all the old residents of Taupo and Tokaanu who have taken a keen interest in the fisheries from the time trout were first planted in the streams and lakes in the district, and the general opinion expressed was that the natural feed for trout has during the last few years decreased very much, the kokopu (*Galaxias fasciatus*) and some other indigenous animals on which the trout feed largely having almost disappeared; that there has been a very large increase in the number of trout during the last three or four years, and that there has been a considerable decrease in the size and condition of the trout, some stating that it was noticeable five years ago, but all agreed that the deterioration has been distinctly noticeable during the last three years.

From the observations made and from the information obtained from reliable sources there would seem to be no doubt but that the following conclusions are substantially correct:—

(*a.*) The natural feed for trout has decreased considerably during the last few years.
(*b.*) Lake Taupo and its tributaries have been fully stocked with trout for some years.
(*c.*) A decrease in the average size and condition of the trout has been distinctly noticeable during the last three years.
(*d.*) A number of trout have been found to be affected with the worm parasite.

Natural Feed.

The principal natural feed is said to be the inanga toetoe, kokopu, koura, a "beetle" (found in the grasses and weeds in the lake and said to have been very plentiful at one time), and grubs, worms, &c. In trying to form an estimate of the extent of the feeding-grounds for trout in Taupo consideration must be given to the depth of water which the indigenous fishes which comprise the principal feed of the larger trout, and the trout themselves, will inhabit. My opinion is that the fishes mentioned as comprising the principal feed for trout inhabit comparatively shallow water, probably not beyond 200 ft. at the most, and as they are themselves principally bottom feeders the 200 ft. line round the lake would be the extent of the trout feeding-grounds as far as these animals are concerned. The rainbow and brown trout are themselves not deep-water fish by any means, and, although the information given by authorities on this point is somewhat meagre, yet from what can be gathered and from personal observations I form the opinion that their limit is very little more than 200 ft. Taupo is a deep-water lake: an examination of the excellent contour map prepared by Mr. Keith Lucas when he made a survey of the lake in 1902 shows that it reaches to a depth of 530 ft. In his description of Lake Taupo Mr. Lucas says, "In point of depth Lake Taupo is roughly divisable into three portions—the southern end, the greater part of which is included between the 300 ft. and the 360 ft. contours; the western bay, which lies chiefly between the 360 ft. and the 420 ft. contours; and the north-east portion, which contains depressions to a depth of 530 ft." The map shows that from the shore to the 300 ft. line gives only a narrow strip round the lake.

There is, of course, a certain amount of surface feed all over the lake, and a considerable quantity is brought down by the rivers and streams, but the principal feed for the larger trout is the indigenous fishes and crustacean mentioned, so that, notwithstanding the great size of the lake, when the question of depth is considered in relation to the bottom feeding-area suitable for trout it will readily be realized that this area is not so extensive by any means as at first might be supposed. In this connection I may mention that in 1902 I was sent to Lake Wakatipu to investigate and report on the deterioration of the brown trout in that lake. I found the lake rather poor in surface feed, and the bottom feeding-area suitable for trout was restricted to the narrow fringe of shallow water round the shores; beyond that shallow fringe the bottom falls suddenly away into water anything from 500 ft. to 1,000 ft. in depth. The natural feed found in the shallow water consisted principally of kokopu, bullies, and koura, but of late years these had almost entirely disappeared, the trout going down in size and condition as the feed disappeared. Within a certain distance of the head of the lake trout were much larger and in very fair condition: this was no doubt due to the natural feed brought down by the Reece River.

Natural Spawning and Increase of Trout in Taupo.

The conditions in the rivers and streams flowing into the lake are exceptionally favourable for hatching out a good percentage of young fish from the eggs deposited; and as the fry have no natural enemies in the shape of eels or other voracious fish to prey upon them, a large percentage should reach maturity. The number of fish which have reached maturity annually during the last six or seven years must have been largely in excess of the number caught. It is not possible to arrive at the exact quantity of fish caught with rod and line last season, but what I consider the most reliable authorities give the maximum quantity for the season at about 75 tons, another says 150 tons, and another 232½ tons. Even allowing that 100 tons were taken out, and allowing the low average of 4 lb. for each fish, it would only account for 56,000 fish taken out last season, and considering the extensive spawning-grounds in the rivers around the lake, ten times that number would seem a low estimate of the number of trout which reach maturity in the lake each year. When the question is given a little consideration the very large increase of trout reported during the last few years is easily accounted for, and this annual increase will go on until steps are taken to take out a quantity each year in proportion to the yearly increase.

Recommendations for the Maintenance and Future Working of the Fishery.

The maintenance of this fishery in a healthy condition is a national work, and every effort should be made to see that this is done. Vigorous and skilful measures require to be taken without any delay. If this is done much time, money, and disappointment will be saved and the good name of the fishery maintained. I have therefore to make the following recommendations:—

(1.) Putting the fisheries of Taupo and Rotorua under the management of a thoroughly skilled expert.
(2.) The systematic thinning-out of the trout in the lake.
(3.) The introduction of some new natural feed for trout.
(4.) Killing of ill-conditioned and diseased fish.
(5). Clearing out all the shag-rookeries in the district, and the systematic shooting of shags.

Taking these recommendations seriatim,—

No. 1. The first thing which is urgently required is putting these fisheries under expert control. Their determination commenced and has gone on unchecked under the present management.

No. 2. At the request of the Tourist Department I reported on the Rotorua and Taupo fisheries in 1910, and in dealing with Taupo Lake I made the following remarks, viz.: "There would seem to be no doubt but what the lake (Taupo) is getting overstocked with trout, as reports this season indicate that the fish are commencing to deteriorate, as a number of ill-conditioned fish are reported to have been taken. As the essential principle of maintaining any fishery in healthy condition is to maintain the food-supply of the fish, it is absolutely necessary, if the Taupo fishery is to be maintained in good condition, that there should be no question of the natural food being preserved. To do this large quantities of trout should be taken out before any serious depletion of the natural feed takes place. If this is not done promptly there is little doubt but that the Taupo fishery will deteriorate. To reduce the number of trout and utilize them to the best advantage I would recommend netting portions of the lake, and in such a way as *not to interfere with angling;* and marketing the fish. As the lake is too far from where the fish can be marketed fresh, it will be necessary to freeze or cure them as soon as caught. Either way there is no doubt but what a ready market would be found for them in the different cities. The freezing, curing, and marketing of the fish is quite practicable, and this would be the best way of profitably utilizing the surplus fish. *The netting should be done thoroughly and the trout so reduced in number that there would be no question of the further depletion of food-supply.*"

The recommendation second in importance is reducing the number of trout in the lake. The manner in which the fish are to be marketed can be decided when the systematic thinning out is decided upon.

No. 3. The introduction of some new fishes to augment the natural feed is most important. Care requires to be taken not to introduce anything which will become a pest later on or prey on the present natural feed. The Cisco or lake herring is one of the most prolific and safe fish which could be imported, and in previous reports I have recommended its introduction. The conditions in Taupo Lake should also, I think, be suitable for the large American whitefish (*Coregonus clupeiformis*). It, too, is immensely prolific, and as its food consists almost entirely of minute insects it would be a perfectly safe fish to introduce. The little silver perch of Australia would probably be another suitable fish, as it is said to be enormously prolific and, although small, an excellent table-fish. I think, however, further inquiry should be made into its feeding-habits before introducing it to our waters.

No. 4. As will be seen from the description of the rivers and streams flowing into Taupo Lake, only a few of the smaller ones can be blocked. Large numbers of ill-conditioned fish could, however, be killed off in Chase's and Tokaanu Creeks, the Whangamata, Waihora, Whakaiapo, and other of the smaller streams round the lake in the spawning season.

No. 5. A careful study of the worm parasite affecting trout in the lakes in the thermal districts has been carried out by the Chief Veterinarian and his officers, and I understand from the last report on the subject that the shag has been proved to be the original host. This opinion coincides with the investigations made by Dr. Edwin Linton, of America, who has made a study of worm parasites affecting fresh-water fishes. In a paper read at the annual conference of the American Fisheries Society held at St. Louis last year he makes the following statement: "As the case now stands concerning the source of the parasite affecting our fresh-water fishes, that source is to be found in certain fish-eating birds." Clearing out the shags as far as possible should therefore mean eventually cutting off the source of infection from the trout.

A matter which came under my notice when at Taupo was the wholesale poaching of trout by Maoris and Europeans in the spawning season. I found evidences of this poaching on almost every stream I inspected, and dead trout with spear-wounds on them were common, and I was told of parties coming from inland with packhorses and taking away loads of fish. Although the fishery will not be injured by a number of fish being killed off, yet all killing and thinning out should be done by the proper authorities. The Natives should be treated liberally with regard to licenses for taking trout in the proper season, but this wholesale killing in the spawning season should be stopped.

Another matter which will have to be taken in hand very soon is the question of the Government acquiring land round certain parts of the lake and along the banks of the rivers. At present nearly the whole of the land is owned by the Natives, and lately they have commenced to charge for the right to erect camps, and also to fish on some of the rivers. Previous to the introduction of trout the value of the lake fishing as a food-supply for the Maoris was comparatively small, and its value to-day is entirely due to the introduction of trout. The Maori, however, owning the land practically holds the key to the fishing. I would recommend that the Government should at once seriously consider the question of acquiring land at all the places round the lake suitable for fishing-camps, and also along the banks of the best fishing rivers.

Rotorua.

Returning to Rotorua from Taupo on the 22nd August, I inspected trout in the Fairy Creek, Ngongotaha, and Utahina Streams on the 23rd, the trout in Hamurana Creek, Ohau Channel, and Okere on the 24th, spawning-beds in the Ngongotaha on the 25th, and the fish in the outflow creek from Rotokakahi Lake and Wairoa Creeks (Tarawera) on the 26th.

At Rotorua I interviewed a number of anglers, some of whom had no connection with the Rod and Gun Club, and also some who were members of that body. Some stated that there was a slight improvement in the condition of the trout in Rotorua Lake last fishing season, others that if there was any improvement it was so slight as to be scarcely noticeable, and others that taking the whole season there was no improvement on the two previous seasons. Some of the anglers who

have fished in Rotoehu, Rotoma, and Rerewhakaitu Lakes last season stated that the fish in these lakes has so far not deteriorated to anything like the extent of the Rotorua and Rotoiti fish, the fish caught in these lakes being of fair size and condition.

Regarding the fish I saw and handled in the streams flowing into Rotorua Lake and in the Ohau Channel, I have to say that, making every allowance for it being the spawning season, they are the poorest specimens of rainbow trout I have ever seen in this or any other country.

As will be seen by the measurements and weights given in the attached tables of the fish examined in the streams flowing into Rotorua Lake, the length in comparison to the weight of each fish is out of all proportion. As a matter of fact, there was not one fish, full or empty, whose weight was proportionate with its length. The average weight of the seventy-seven fish examined was slightly over $1\frac{3}{4}$ lb. Trout and salmon lose rather less than a third of their weight from the time they leave the feeding-grounds to the end of spawning, but even allowing a third to be added to the average weight of the fish examined their weight before spawning would only be about $2\frac{1}{2}$ lb. It will also be seen that the fish examined at Rotokakahi Lake and the Wairoa Creek (Tarawera) are in considerably better condition than the Rotorua fish, and that the percentage affected with the worm parasite is not so great. The reason of the better size and condition of the fish is, I consider, due to these lakes not being nearly so heavily stocked as Rotorua and Rotoiti, and this I think can be accounted for by the comparatively small number of young fish which can be hatched out and reared on the spawning-grounds. The available spawning-grounds at each lake are limited in extent in comparison to the extent of water to be stocked, and owing to the fish crowding on to this limited space the waste during spawning must necessarily be enormous, and the number of fry hatched and reared every year comparatively small.

A steady deterioration has taken place in the Lake Rotorua fishery during the last five years, and I can only characterize its present condition by saying that in my estimation it would scarcely be possible for a fishery to be in a worse condition than this one is at the present time. To have any effect in restoring it to a healthy condition drastic measures will have to be taken. No settled method of dealing with the fishery seems to have been decided upon, and the result is that it has continued to drift from a bad to a worse state.

Rotorua and Rotoiti Lakes are now practically full of weakly and diseased trout, a large percentage of them being, no doubt, the progeny of the thousands of ill-conditioned and diseased fish which have been allowed to propagate during the last few years. In order to effect a change for the better more drastic measures will have to be employed now than would have been necessary a few years ago—half measures will only mean disappointment and waste of money. A settled method of dealing with the fishery should be decided upon, and the work carried out systematically and skilfully as long as necessary. My opinion is that if the work is gone about in the right way a very great improvement in its condition can be effected in a comparatively short time.

The recommendations which I have to make with regard to the fisheries in the Rotorua Lake and district are as follows, viz. :—

(1.) The systematic killing-off as far as possible of all ill-conditioned and diseased trout and the thinning-out of fish in all the lakes as may be necessary.

(2.) The importation for several years in succession of rainbow-trout eggs from California.

(3.) The systematic introduction of some new natural feed for trout, as recommended in connection with Taupo Lake.

(4.) The continuation and extension of the investigations in connection with the worm-parasite disease, and a biological survey made of all the lakes in the Thermal District.

(5.) Clearing out the shag-rookeries, &c., as recommended in connection with Taupo Lake.

(6.) The collection of trout-eggs in large quantities from streams in the Thermal District where the best fish exist, and supplied to outlying districts throughout the Dominion free of cost and to all acclimatization societies at the lowest possible price.

The above recommendations are practically those which I made in 1910, and I still think that they embody all that is required not only to prevent further deterioration in any of the lakes, but also to restore these fisheries to and maintain them in a healthy condition.

With regard to the first, no skilful effort has ever been made to block the streams and prevent ill-conditioned and diseased fish having access to the spawning-grounds. The effort to "block" the streams with wire netting in 1910 was practically a failure as far as blocking them was concerned, for the spawning-grounds that season were just as crowded with fish as in any previous season. The result of such a large number of "slabs" being allowed to propagate must be that a considerable percentage of the trout in Rotorua and Rotoiti Lakes to-day are the progeny of these fish.

With regard to the second recommendation, clearing out the "slabs" and diseased fish from Rotorua and Rotoiti Lakes will mean that the bulk of the fish will be killed off, and it should be restocked with "fresh blood." The introduction of "fresh blood" into other lakes where "slabs" exist in any number is also advisable.

Very good work indeed has been done by the Chief Veterinarian and his officers in connection with the worm-parasite disease, but an extension of the work is necessary, and in this connection I would recommend an examination of trout from several rivers in the Thermal District, an examination of trout from lakes and rivers in other districts, and also an examination of shags and other fish-eating birds in various parts of the Dominion.

The value of the rainbow-trout fisheries of the Rotorua District demands that every effort should be made to restore them to a condition that will make them again one of the chief attractions to that district. In 1906 they were the finest sporting fishing in the Dominion, and probably unsurpassed as a rainbow-trout fishing in the world; to-day they provide little or no

attraction for the sportsmen, or value as a food-supply. Money judiciously spent on their improvement would, I consider, be well invested for the country.

I have, &c.,

L. Y. Ayson,
Chief Inspector of Fisheries.

The Secretary, Marine Department, Wellington.

P.S.—In connection with the netting, curing, and marketing of fish from any of the lakes, I do not think it would be advisable to hand over the right to do it to any private individual or company.

On the 23rd August, assisted by Mr. Moorhouse and his men, I made an inspection of the trout in streams flowing into Rotorua Lake. Commencing at the Fairy Creek, a large number of fish were netted, and twenty were taken without selection and each fish measured, weighed, and examined for disease. The following tables gives the results :—

Number of Fish.	Length (in Inches).	Weight (in Pounds).	Sex.	Affected or not with Parasite.	Remarks.
			Fairy Creek.		
1	16¾	1½	Male	Affected	Spawned.
1	16	1½	,,	,,	,,
1	23	5½	Female	,,	Not spawned.
1	21	4	,,	Not affected	,,
1	19	2½	Male	Affected	Spawned.
1	20	2½	,,	,,	,,
1	17½	1¾	Female	,,	,,
1	19	2½	Male	,,	Not spawned.
1	17	2	,,	,,	,,
1	18	1½	Female	,,	Spawned.
1	18	1¼	,,	,,	,,
1	15	1	Male	,,	,,
1	19	2½	,,	,,	Not spawned.
1	18	1½	Female	,,	Spawned.
1	16½	1¼	,,	,,	,,
1	18	1¾	,,	,,	,,
1	18½	1¾	,,	,,	,,
1	16½	1½	Male	,,	Not spawned.
1	16½	1¾	,,	,,	,,
1	19	1¾	,,	,,	Spawned.
			Utahina Stream.		
1	13½	3¼	Male	Affected	Spawned.
1	18	2	Female	Not affected	Not spawned.
1	16	2¼	Male	,,	,,
1	16	1	,,	,,	,,
1	17	2	Female	,,	,,
1	18	1½	,,	Affected	Spawned.
1	20	2¾	,,	Not affected	Not spawned.
1	17½	1½	,,	Affected	Spawned.
1	16	1½	,,	,,	,,
1	17	2	,,	Not affected	Not spawned.
1	16¼	1½	Male	Affected	Spawned.
1	17	2	,,	Not affected	,,
1	10	0¼	Female	,,	Not spawned.
1	17	1¾	,,	Affected	,,
1	20	3	Male	,,	,,
1	15	1½	Female	,,	Spawned.
1	15	1	,,	,,	Not spawned.
1	15	1½	Male	,,	,,
1	19½	2½	Female	,,	,,
1	16½	1¼	Male	,,	,,
1	16	1½	Female	,,	Spawned.
1	17	2	Male	,,	Not spawned.
1	20½	3¾	,,	Not affected	,,
1	20½	3½	Female	,,	,,
1	16	1½	,,	Affected	,,
1	23	4	,,	Not affected	,,
1	15	1¼	,,	Affected	Spawned.
1	17	1	,,	,,	Not spawned.
1	20	2¼	,,	,,	Spawned.
1	16	1¼	Male	,,	,,
1	16½	1½	,,	Not affected	,,
1	20	2¼	,,	Affected	,,

Number of Fish.	Length (in Inches).	Weight (in Pounds).	Sex.	Affected or not with Parasite.	Remarks.
			Ngongotaha Stream.		
1	24	4½	Female	Not affected	Not spawned.
1	17	1¼	,,	Affected	Spawned.
1	23	3½	,,	,,	Not spawned.
1	17	1¼	Male	,,	Spawned.
1	17½	1¼	Female	,,	,,
1	16	3¾	Male	Not affected	Not spawned.
1	21	2¾	Female	Affected	,,
1	18	1¼	Male	,,	Spawned.
1	15	1	,,	Not affected	,,
1	15½	0¾	Female	Affected	,,
1	14½	0¾	Male	,,	,,
1	19	2	,,	Not affected	Not spawned.
1	16	1¼	,,	Affected	Spawned.
1	15½	1	,,	,,	,,
1	17	1¼	Female	,,	,,
1	16	1¼	Male	,,	,,
1	16½	1	Female	,,	,,
1	18	1½	Male	,,	,,
1	23	3½	,,	,,	Not spawned.
1	17	1¼	,,	,,	Spawned
1	19½	2	,,	,,	,,
1	21	2¾	,,	,,	Not spawned.
1	18	1¾	Female	,,	Spawned.
1	18½	1¾	,,	,,	,,
1	17	1½	,,	,,	,,
			Wairoa Creek (Tarawera).		
1	24	5	Female	Not affected	Not spawned.
1	18	4	,,	,,	,,
1	18½	2½	Male	,,	Spawned.
1	20	2½	Female	Affected	,,
1	19	2½	,,	,,	,,
1	19	3	Male	,,	,,
1	20½	5	,,	Not affected	Not spawned.
1	19	3	,,	,,	,,
1	20½	3	,,	Affected	Spawned.
1	17	3	Female	,,	,,
1	21½	3	,,	,,	,,
1	20	2½	,,	Not affected	,,
1	21	3	,,	,,	,,
1	22½	3½	,,	Affected	Not spawned.
1	20	2½	Male	,,	Spawned.
1	20	3	Female	,,	,,
1	23	4½	,,	,,	,,
1	18	3	Male	Not affected	,,
1	20	3	,,	Affected	,,
1	18	2½	,,	,,	,,
			Rotokakahi Lake.		
1	22	3	Female	Not affected	Not spawned.
1	18	2½	,,	,,	Spawned.
1	20½	2½	,,	Affected	,,
1	20	2	,,	Not affected	,,
1	20½	2¾	,,	,,	,,
1	26	7	Male	,,	Not spawned.
1	20	2¾	,,	,,	,,
1	21	3	,,	,,	,,
1	22½	5	,,	,,	,,
1	17½	2	,,	,,	Spawned.
1	20	3	Female	,,	Not spawned.
1	17	2	Male	,,	Spawned.
1	17½	2	,,	,,	,,

SIR,— Auckland, 14th March, 1910.

I have the honour to supply the following report on my recent visit to Rotorua to investigate and advise the Tourist Department with regard to the unsatisfactory condition of the fisheries there at the present time.

As instructed by you, I proceeded to Rotorua and met Mr. Robieson, Director of the Tourist Division, there on Tuesday, the 8th instant. On that date we inspected the mouths of the Fairy Creek, Ngongotaha, Waititi, and Awahou Streams to decide on the best plan and way to block them in order to prevent all fish from getting up in the spawning season. On the 9th I inspected the Ohau Channel and Hamurana Creek, and on the 10th the creeks flowing into Lakes Rotorua and Rotoiti on the east side, and Lake Rotoehu. During my visit I had the opportunity of seeing a good many fish which were caught by anglers in Rotorua Lake, among them a large catch taken off the Hamurana Creek.

Of the fish which I saw myself, quite 30 per cent. were in poor condition, and a good many of them affected with the parasite disease.

I also had the opportunity of seeing a catch of fish from Rotoehu. These were all in fine condition, and perfect specimens of the rainbow trout.

I also had the opportunity of discussing fishery matters with some of the leading anglers of Rotorua and district, and with the president and some of the members of the Rotorua Rod and Gun Club.

In 1906, when taking trout-eggs at Rotorua, I had an opportunity of handling a large number of trout and getting a practical insight into the deterioration of the fish in that lake.

While ill-conditioned and diseased fish were first found some years ago in Rotorua and Rotoiti Lakes, and while the evil is still much more prevalent there than anywhere else, yet it seems that the trouble has now extended to Tarawera and Rerewhakaitu Lakes, and this season reports from Taupo indicate that it now exists there to a considerable extent.

With regard to the extent to which the deterioration of the fish exists in Lakes Rotorua and Rotoiti, it is apparent that a very large percentage of the fish are affected. Some of the leading anglers and residents who have made careful observations say 30, some 40, and some say that at least 50 per cent. are affected.

There would seem to be little doubt but what the cause of the large number of ill-conditioned and diseased fish in these lakes is due to overstocking and the consequent depletion of the natural feed, and to the parasite disease which is now prevalent among the fish. There is, however, the probability that the natural life-limit of the rainbow-trout, and the reversion of this fish to its natural size, may to some extent be contributing causes. A careful study of the life habits of these fish in this country, and particularly in the lakes and streams of the thermal region, having in mind their probable relationship to that seagoing fish the steelhead trout (*Salmo Gairdneri*) of the Pacific coast, would not only be an interesting study, but would also be of great value in determining the conditions under which these fish can exist in a healthy state in such waters.

Had this Rotorua fishery been handled in a skilful manner from the commencement, the present very unsatisfactory condition would not have existed so far as overstocking is concerned, and a great deal could have been done long before this to check the disease which exists. In order to restore the fishery to a healthy condition, vigorous, systematic, and skilful measures will have to be adopted, and a considerable amount of money will have to be spent in order to carry out what is required.

The recommendations I have to make, and which I consider necessary in order to effect a decided improvement in the condition of the fisheries, are as follows:—

(1.) The proposed killing-off of ill-conditioned and diseased fish to be done thoroughly, skilfully, and systematically.
(2.) Careful and systematic investigation of the worm disease to be commenced at once.
(3.) A thoroughly skilled fish expert to be appointed to work the fisheries for the Department which controls them.
(4.) The systematic introduction of natural feed, such as some species of the Coregonus, shrimps, &c., and the protection of the koura, the fresh-water crayfish.
(5.) The importation of a shipment of rainbow-trout eggs every three or four years from California, in order to introduce new blood.
(6.) The sale of surplus well-conditioned fish to be allowed and carried out by the Department controlling the fishery.
(7.) Taking of trout-eggs to be done only by those what have a thorough knowledge of the work.
(8.) Trout-eggs to be supplied to outlying districts in the Dominion either free or at the actual cost of production.
(9.) Making it illegal for anglers to throw back into the water any ill-conditioned and diseased fish taken by them. All such fish to be taken ashore and buried.

Taking the above recommendations seriatim,—

No. 1: I have to say with regard to the first that in order to prevent ill-conditioned and diseased fish having access to the spawning-grounds, and in order to assist in the capture of these fish, I would recommend the construction of substantial wooden "racks" at the mouths of all streams flowing into Lake Rotorua. Wire-netting barriers I consider useless, as they are very liable to be washed out when the streams are in fresh. The racks can be made by driving strong stakes, say, not less than 4 in. by 4 in., on an angle of about 45 degrees up-stream. These stakes must be put in firmly about 6 ft. apart, right across the stream, and braced as shown in the rough sketch attached. Nail a 4 in. by 2 in. rail along the top and bottom on the up-stream side of the stakes, then drive the slats (2 in. by 2 in. stuff) well into the bottom about $1\frac{1}{2}$ in.

apart, and nail on to the rails top and bottom. When the water is deep it may be necessary to put on an intermediate rail and nail the slats to the top and bottom rail only. When the bottom is soft, place manuka scrub on the bottom in front and behind the rack to prevent scouring out.

The netting-ground below the rack should be cleared of all obstructions. The best net to use is a purse seine. Captain C. A. Nielsen, Port Ahuriri, Napier, is the best maker of these nets that I know of in the Dominion.

All well-conditioned fish must be carefully handled and passed up-stream. If men skilled in handling fish are employed the handling of the healthy fish can be reduced to a minimum, otherwise a considerable number are liable to be injured.

Proper arrangements should be made for the disposal of the ill-conditioned and diseased fish killed. As the number of fish killed will be considerable, the question of converting them into fertilizer should be considered, as this would be the most economical and cleanly way of disposing of them. The whole work of netting, sorting, and killing fish should be carried out with as little publicity as possible, and only those employed or connected with the work should be allowed to be present.

It is difficult to form anything like a correct estimate of the cost of carrying out this work the first season, but, roughly, I estimate that to do the work thoroughly it will take about £450, made up as follows: Material and construction of racks at the mouth of all streams flowing into Lake Rotorua, about £180; wages of four men throughout the season—say, from the 1st April to the end of August—about £250; two purse seine nets, £20: total, £450.

No. 2: With regard to the second recommendation—so far the investigation of the life-history of the parasite has not been followed up, and until this is understood it will be impossible to carry out effective preventive measures. The latest information with regard to this matter is that, besides the trout, shag, and toetoe, the fresh-water crayfish and fresh-water mussel are also affected with the worm.

No. 3: So far the fish-cultural work has not been carried out in a skilful manner, and at present the Tourist Department's officers who supervise this work can only be said to possess an amateur knowledge of fishery-work.

No. 4: The introduction of fresh natural feed is most important, and if undertaken systematically will undoubtedly be successful, and I think a great deal can be done to improve the indigenous natural feed by protecting the fresh-water crayfish in properly constructed enclosures in suitable localities round the shores of the lake.

No. 5: It is very probable indeed that the introduction of fresh blood at intervals will assist in the permanent improvement of the fish. Supplies of rainbow eggs could easily be obtained from the State Fish Commission for California.

No. 6: Until the proper balance of trout and the natural food-supply in the lakes can be maintained, this would be the most economical means of disposing of the surplus well-conditioned fish. It can be done without interfering with the angling, and if undertaken by the Department it could be carried out profitably and without risk of abuse.

No. 7: The stripping of fish by amateurs is liable to prove injurious to the fisheries, as a considerable number of the fish handled are sure to be injured. Where amateurs are employed to do this work, I should recommend all the fish they strip should be killed. Only qualified fish-culturists who have a knowledge of the anatomy of the fish should be employed to do this work.

No. 8: Taking trout-eggs in large numbers from the Rotorua fishery during the next few years will benefit the fishery. There are several places in the Dominion, such as the rivers in South Westland, which it would be profitable for the Government to have stocked with fish. It would be beneficial to the Rotorua fishery to have the eggs taken away and profitable to the country to have the other rivers stocked.

No. 9: When at Rotorua I found that the common way by anglers of disposing of all the ill-conditioned and diseased fish killed by them was to throw them back into the water. I saw numbers of dead and decaying fish in the streams and various places in the lake. This is a most objectionable practice, and should be put a stop to at once, as the decaying fish is liable to produce other diseases among the fish in the lake.

Every one of the recommendations which I have made in this report is quite practicable, and I consider they are all necessary for the effective and healthy working of this fishery. I consider it is a national work to restore this fishery to a healthy condition, and no expense should be spared to have this done. The good name of the whole of the fresh-water fisheries in the Dominion is at stake. I am aware that already sportsmen returning to England, Europe, and America have spread the report that a great many of the fish in the Auckland District are in poor condition and diseased, and random statements made by some of these sportsmen and tourists have been applied to the whole of our fresh-water fisheries. I have, &c.,

L. F. Ayson,
Chief Inspector of Fisheries.

The Secretary, Marine Department, Wellington.

Sir,— Auckland, 22nd March, 1910.

I have the honour to supply the following supplementary report on the trout fisheries of the Rotorua and Taupo districts.

In my report of the 14th instant I omitted to deal specially with Taupo Lake, and in connection with that fishery I now wish to make the following remarks and recommendations. There would seem to be no doubt but that that lake is getting overstocked with trout, and reports this season indicate that the fish are commencing to deteriorate, as a considerable number of ill-con-

ditioned fish are reported to have been taken. As the essential principle of maintaining any fishery in a healthy condition is to maintain the food-supply of the fish, it is absolutely necessary if the Taupo fishery is to be maintained in good condition that there should be no question of the natural feed being preserved. To do this, large quantities of trout should be taken out before any serious depletion of the natural feed takes place. If this is not done promptly, there is little doubt but what the Taupo fishery will quickly degenerate to the present condition of the Rotorua fishery. To reduce the number of trout in Taupo Lake and utilize them to the best advantage I would recommend netting portions of the lake, and in such a way as not to interfere with angling, and marketing the fish. This should be done by the Department which controls the fishery.

As the lake is too far from where the fish can be marketed fresh, it will be necessary to freeze or cure them as soon as caught. Either way there is no doubt that a ready market would be found for them in the different cities. The freezing, curing, and marketing of the fish I consider quite practicable, and this would be the best way of profitably utilizing the surplus fish.

The netting should be done thoroughly, and the trout so reduced in number that there would be no question of further depleting the food-supply.

In connection with the whole question of the future working of the fisheries in the Rotorua and Taupo districts, I would recommend that the Government should seriously consider the advisability of placing their control and working under the Marine Department. This would seem to be by far the most economical way of having them worked in a skilful manner. To carry out the thorough and drastic measures necessary to restore the Rotorua fishery to a healthy condition requires expert knowledge and the services of a skilled staff of fishery officials. The Tourist Division, which controls the fishery at present, unfortunately has no one with an expert knowledge of fisheries, and to provide these would mean a large annual sum. On the other hand, the Marine Department, having a staff of skilled fish-culturists and fishery officers, are already fully equipped to carry out the work with no extra expense to the country as far as salaries are concerned.

I have, &c.,

L. F. Ayson,
Chief Inspector of Fisheries.

The Secretary, Marine Department, Wellington.

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