

1886.
NEW ZEALAND.

CORRESPONDENCE RELATING TO THE INTRODUCTION OF
FISH OVA.

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

No. 1.

The Hon. the COMMISSIONER of TRADE and CUSTOMS to the AGENT-GENERAL for New Zealand,
London.

SIR,—

Wellington, 15th August, 1885.

I have the honour to bring under your notice the question of whether you would be able to forward, from time to time, shipments of various fish ova in an inexpensive manner.

Last year, as you are aware, a gentleman was sent Home by the Government and the acclimatization societies conjointly at a considerable expense. Application has been made to send the same gentleman Home again, but the cost seems unnecessary, if, as we are informed on good authority, it be the case that fish ova can now be so packed as to come out with complete safety in the freezing chambers of steamers. We have information that parcels of ova from Washington, after being sent the long and rough journey by rail to San Francisco, have been forwarded thence to New Zealand, and arrived in good condition, the whole cost of conveyance from Washington being, for a considerable parcel, not larger than £37. The establishment in Washington which packs the ova is, I believe, a Government one.

It occurs to the Government that you may be able to procure ova at a comparatively small expense properly packed, and forward them by the direct steamers of either lines. It might be arranged, if you thought it necessary, besides freight, to promise some reasonable gratuity to the men who would have particular charge of the boxes during the voyage.

The ova which it would be desirable to send are those of the salmon, herring, lobster, and the crab. As regards the treatment of salmon ova, there is a considerable amount of knowledge and experience in the colony, but I doubt whether the same can be said with respect to the ova of the herring, lobster, or crab, and we should be much obliged if you can with such ova, or in anticipation of its arrival, send advice and suggestions as to the mode of treatment. I am informed that there is a professor in Edinburgh who has made the herring the subject of his special attention. I forget his name for the moment, but believe he has had some correspondence with your office.

If I am right in supposing that you will at comparatively small expense be able to send by different steamers shipments of ova, it would be well to arrange to let us know in advance of their arrival, either by previous mail or by cablegram. In anticipation of the latter, I attach some special code words.

I may observe that I have spoken to Captain Hallet, of the "Rimutaka," and that gentleman assured me he would be happy to bring out some fish ova, and give them special attention during the voyage.

The Agent-General for New Zealand, London.

I have, &c.,

JULIUS VOGEL.

No. 2.

The AGENT-GENERAL to the Hon. the COLONIAL SECRETARY.

SIR,—

7, Westminster Chambers, London, S.W., 30th October, 1885.

I received in due course your letter of the 15th August last, informing me of the method the Government now wished to be adopted in further shipments of ova.

In doing what I can to carry out these instructions, I ought to confess that I feel in some difficulty. I had taken the greatest pains all through 1883 and 1884 to interest many people in this country, eminent for skill and experience in pisciculture, about sending ova to the colony, on the supposition that the spasmodic experiments which had been going on for so many years were to be superseded at last by a systematic and persistent action on the part of the Government itself, extending over some seasons at any rate. The first experiment of sending out ova in a "moist-air chamber" and at a regulated temperature was made in the steamship "Ionic" in January, 1884; and it is hardly open to doubt that this method was not only in itself a right one, but in fact, as was said by the Hon. Colonial Secretary in his letter of the 25th April, 1884, the best that had till then been devised. Further experience, however, had shown that the first expense of that method would not have to be repeated. A shipment of trout ova privately made by Sir James Maitland had brought out most valuable information, showing how cheaply as well as safely ova could be got out under certain conditions; and when the reports came Home of our shipment by the "Ionic" Sir

James wrote to me that he had no doubt whatever of “perfect success next season, as we had now the key to the whole problem—namely, the period which ought to elapse between spawning and packing, and could insure the success of every egg we sent.”

Very little interest, however, seemed to be taken in the colony on the subject. No papers were presented to Parliament in 1884, and when the new plan was decided upon, of subsidizing the acclimatization societies, no one apparently had realized that its first effect must be to deprive the colony of the particular feature which had created so much interest here—namely, a belief in the serious and persistent intention of the Government to follow up their experiments year by year until the success which was sure to come had been achieved. Many eminent pisciculturists had continued all through 1884 to look with keen interest to a renewal of the work in the coming season. Professor Huxley, then Her Majesty's Inspector of Fisheries, had given me his official exequatur for England and Wales, and had promised to go into all the details with me at the proper time in October. Mr. Ridley, Chairman of the Tyne Conservancy, had not only made most valuable and novel suggestions, but had provided everything for the taking and packing, so as to be ready for the first great run of fish in the Tyne. The Chairman of the Severn Conservancy had taken great pains about preparations for that river. All the Scotch Fishery Boards had acceded heartily to my request for leave to take ova, and their several superintendents had been ordered to be in readiness with nets and men at the proper moment. Sir James Maitland, who had done so much for us in 1883, had begun the preparations for 1884 with enthusiasm. We were to have had the services lent to us by the Home Office of Mr. Eden, Curator of the Buckland Museum at South Kensington, who would have been sent as soon as the Forth salmon should commence running; and, as the late Mr. Buckland's method of spawning differed from Sir James Maitland's, the two systems were to have been tested together at Howietoun Fishery. Everything had been made ready for the work on the Tyne, Tweed, Forth, and Teith, and the first twenty thousand ova had actually been got, with the certainty of a great quantity more in a few days, when your letter came telling me of the new plan that had been decided upon, whereupon all the pains that had been taken here were thrown away.

But, while a new plan was chosen, the societies did not give it much chance of success. I can only suppose it was from forgetfulness of the proper season that they delayed so long in sending Mr. Farr; at any rate, he was only leaving New Zealand within a few days of our taking the first twenty thousand ova here, and he not only did not get Home till the 13th December, but even then did not leave for Scotland till January. I had taken care to get the Fishery Boards to transfer to him the leave for taking ova, without which he would not have been allowed to move at all; and he throughout received in this office, especially from Mr. Kennaway, cordial help, which I do not observe he has anywhere acknowledged. When he got to Scotland he was met by the same assurances on every side that he had come too late; nor does it need more than a glance at his report, presented to Parliament last session, to see that it was by the merest accident he got any ova at all, and that the expense of his mission was very nearly thrown away.

The difficulty does not lie so much in getting ova as in getting them at the right moment, fertilizing them, and packing them in the right way when they are got. The whole process of their preparation from first to last is one for which there must be knowledge, skill, experience, incessant minute attention, and, above all, enthusiasm, to say nothing of a good deal of expense. I am not, for my own part, a believer in achieving success without.

I am not able even to ask again for the same personal interest and help as were so willingly given in 1883 and 1884; but I shall, of course, do what I can, all the same, to carry out the present views of the Government. I have had a long talk to-day with the new inspector, Mr. Berrington, who was appointed only last week, and for whose appointment I had been waiting. As you are no doubt aware, the question of herring, lobster, and crab does not press at this time of year; and, although it is not much that the Fishery Department can do for us in salmon ova, as they can neither undertake supervision nor responsibility, Mr. Berrington will, at any rate, do all that is in his power. Our chief hope must be, as before, in Sir James Maitland and the Scotch Boards, if they will overlook the disappointments of 1884. If they will, I may yet be able to send you some ova this season.

No doubt the professor to whom you allude is Professor Cossar Ewart, with whom I shall soon be again in communication about herring.

I have, &c.,

The Hon. the Colonial Secretary, Wellington.

F. D. BELL.

No. 3.

The Hon. the COMMISSIONER of TRADE and CUSTOMS to the AGENT-GENERAL for NEW ZEALAND, London.

SIR,—

Government Buildings, Wellington, 31st December, 1885.

The Colonial Secretary has handed me your letter No. 1338, dated the 30th October, last as I believe, in reply to mine of the 15th August. I may mention that the subject to which these letters refer is now within the Customs Department under my charge, and I will ask you to be kind enough to address me when writing on the matter.

I may at once say that when, after newly taking office, the Government acceded to the request made by the acclimatization societies to send Mr. Farr to England, they were not, to the best of my belief, aware of all the exertions that you had made in regard to sending out ova, as shown by your letter now under reply. The request to send Home Mr. Farr was strongly pressed upon the Government, and they acceded to it, although they felt at the time that it was an expensive way of getting out fish ova, seeing that large parcels had arrived in the colony without any one specially in charge of them, and, as I mentioned to you before, fish ova has been packed in Washington, sent across to San Francisco by train, and forwarded thence to New Zealand, arriving in good condition.

Although you must feel naturally disappointed that the arrangements you previously made were not taken advantage of, I trust that this explanation will remove from your mind any impression that the Government deliberately overlooked them, and that you will to the best of your ability forward shipments from time to time, in such a manner as you think desirable. I feel it is unnecessary for me to make any further remark, as your letter shows that you are more fully cognizant of the subject than I can pretend to be. I have only therefore to say that the Government will highly appreciate any exertions you are able to make in the desired direction.

I have, &c.,

The Agent-General for New Zealand.

JULIUS VOGEL.

No. 4.

The AGENT-GENERAL to the Hon. the COLONIAL SECRETARY.

SIR,—

7, Westminster Chambers, London, S.W., 18th November, 1885.

Since writing to you on the 30th October, No. 1338, I have been engaged in the endeavour to carry out your instructions about fish ova.

1. *Salmon.*

I have taken steps for getting from 50,000 to 100,000 Rhine ova from the Seewiese Fishery at Gemünden, 50,000 Rhine ova from Switzerland, 50,000 Scotch ova from the Solway Fishery, and 50,000 from the Tyne. Sir James Maitland would gladly have lent me one of his men for work in Scotch rivers if your present plan had allowed of my employing people to get ova myself; and he would have received any that I got, and incubated them at Howietoun Fishery until they were ripe for packing. I do not propose at present to get any Norwegian ova. Mr. Searle, who, as you know, was associated with the late Mr. Frank Buckland, tells me that Rhine ova are now preferred here to home-bred eggs.

It is, however, quite a mistake to suppose that ova can be got cheap in this way. The Seewiese Fishery supplies Rhine ova at the cheapest rate, 7s. per 1,000; the Swiss ova will cost about twice as much; Scotch ova will cost £1 2s or £1 3s for a large quantity, and £1 10s. for small lots. I hardly think it will be found that under your present method ova can be sent out for much less than £1 per 1,000 all round, which would mean £500 for half a million eggs. Now, apart from the moist-air chamber and freight, the actual expenditure here in 1883 was but little over £200, and I certainly should not have spent £400 in 1884 if a stop had not been put to what I was doing; while there is no doubt but I should have got at least a million ova. To use a phrase of one of the river superintendents to Mr. Farr, "a cartload of them" could have been got with the preparations that I had made. There is no need to send any one Home specially to do what is done every day at fishery establishments possessing the most perfect appliances in the world. But there are a number of things which can only be done by experts possessing special knowledge, experience, and skill, and about which you must be completely in the dark unless an expert is employed to do them, besides running a great risk of throwing money away. To take the single question of "eyed" ova, Mr. Capel, author of "Trout Culture," does not believe that eyed ova can be got out safely. But the last report of the Tasmanian Fishery Department shows that out of ten thousand eggs in that stage almost every egg hatched out right; and Mr. Saville-Kent has now advised the Salmon Commissioners to import only eyed ova into Tasmania. Mr. Farr's shipment of last March is also conclusive on the point. But all the same there is a practical difficulty where an expert is not actually employed to get and look after the ova from first to last. If you send out "eyed" ova, who can tell whether the margin of time that is left before hatching is not too small? If you send out ova that are not eyed, who can be sure when they were taken, or know anything about their impregnation? In the south of England salmon ova become eyed somewhere about forty days after spawning, and in the colder climate of Scotland perhaps fifty days; though in either case the time may vary according to the temperature of the water. They hatch out at various periods, according to the conditions in which they may be placed. They have been "forced" into life in sixty days from impregnation, and even this time has often been greatly shortened. But this is not natural, as the normal time from impregnation is from ninety to one hundred and twenty days, and it may even be prolonged to one hundred and forty days. I believe that the most constant source of failure has been that ova were sent out which had never been impregnated at all; and you will perhaps remember Mr. Farr saying, in a letter recently published at Christchurch, that, having unpacked every shipment allotted to the Canterbury Society, he could without hesitation declare that not 10 per cent. of the ova had ever been fertilized. Again, what is the proper time that ought to elapse between spawning and packing? Sir James Maitland thinks that if ova are packed on the thirtieth day 90 per cent. of them ought to arrive safely. Mr. Farr, however, has shown that ova packed thirty-nine days after fertilization, and reaching New Zealand ninety-two days after being taken from the parent fish, got out safely. Such points as these can only be settled by repeated trials, to which minute attention has been given by experts specially employed.

It is by no means certain that the method you have now decided on, of sending out boxes of ova in the freezing chambers, does not involve their exposure to a temperature in which they cannot live. Sir James Maitland thinks that if they could be packed sufficiently dry, and in trays surrounded by a thick layer of saw-dust, they might stand the cold; and he also conjectures that ova which are to be subjected to a temperature much below freezing point ought perhaps to have been in that temperature for twenty-four hours before stripping. No one can doubt that, so far as experience up to this time goes, the safest temperature is a little over freezing, or from 32° up to 35°. Mr. Armistead (of the Solway Fishery) thinks a temperature a little above freezing would

only just retard the development of the ova enough to make the long voyage safe ; while Mr. Searle believes that in most of the shipments the eggs have been too much nursed. But, at any rate, this may be said of your method : that if ova can live in the refrigerators the problem of bringing the *Salmo salar* into New Zealand is practically solved.

2. Lobster and Crab.

I am still engaged upon inquiries respecting these, and Mr. Berrington is investigating a number of points of interest for you ; but at present he is satisfied that as regards the lobster our only chance of success is to send out the “fish” itself. This could be done at any time of year, though most likely the best would be just before spawning in the summer ; but then, it involves difficult and expensive arrangements for feeding the fish during the voyage, and for cooling and aerating their tanks, besides a good deal of risk from the motion of the ship. As to crab, there would be no use in trying at all unless the lobster succeeded, on account of its being so dainty and fastidious. Both must have fish diet ; but the crab's must be perfectly fresh, while the lobster's need not. As any admixture of fresh water in the tanks would kill the fish, the ice would have to be applied from the outside ; and this by itself means a good deal of expense for the constant attention and care of a special attendant throughout the voyage.

3. Herring.

I am in communication with Professor Cossar Ewart, who has already given me very valuable information, and with whom I am to confer more fully when he comes to London. He and Sir James Maitland are both on the Scientific Committee of the Fishery Board for Scotland, and have more than once consulted together about getting out the herring. Mr. Ewart's experiments have led him to the following conclusions : (1.) The west coast herring is the most suitable for New Zealand waters. (2.) The best place to obtain ova is at the Ballantrae spawning bank, off the Argyshire coast. (3.) The best time of year for securing an abundant supply is February. (4.) The ova should be sent out in glass hatching-jars, like those used for shad eggs in America. (5.) The hatching can be delayed until the fortieth day after impregnation, and the fry will survive for about eight days after hatching without food. This of course leaves very little margin of time where the voyage takes from forty-two to forty-five days.

Mr. Ewart thinks that a preliminary experiment might be made next February, but that before anything is done complete arrangements ought to be made in the colony for the reception of the ova or fry, and that it will at any rate be necessary to have a small closed piece of water where they may be introduced ; or, better still, some floating-cars in a quiet creek where the fry would get no nourishment. By keeping some of them under observation in this way it would be possible to learn the probable fate of those turned into the open sea, while to turn them all into the sea on their arrival would be most unsatisfactory. I have told him that I think there is already good provision at the hatcheries in New Zealand for what he advises ; but perhaps you will call the attention of the acclimatization societies to the matter.

Only partial success in handling herring ova seems to have been yet attained ; but, so far, I am told that spawning on stones and dropping the ova into the sea has had the most result. Mr. Ewart intends making some experiments to determine the best method for delaying the hatching of herring ova on board ship ; but there are great difficulties, and I certainly was surprised to see, from Mr. Farr's report, that he himself anticipated none.

Both the shipping companies have very handsomely promised to co-operate in sending out any ova in their steamers this season.

The Hon. the Colonial Secretary, Wellington.

I have, &c.,
F. D. BELL.

No. 5.

The Hon. the COMMISSIONER of TRADE and CUSTOMS to the UNITED STATES COMMISSION, FISH and FISHERIES.

SIR,—
Department of Trade and Customs,
Wellington, New Zealand, 10th October, 1885.

Several of the acclimatization societies in this colony, aided by a grant from the Government, sent a gentleman last year to England to bring out salmon ova. The result of this venture was satisfactory from the fact that a considerable quantity of healthy ova was landed in New Zealand, which was afterwards hatched out, and most of the young fish have since been liberated ; the cost, however, was so great that it would be impossible in the same way to import the quantity of ova required to stock our rivers and lakes within a reasonable time.

It is understood that the packing of fish ova and its transportation for long distances in the United States is now carried on with complete success and in an inexpensive manner. Relying on the kindness shown by you some years ago in assisting the Agent of this colony to procure white-fish ova—for which assistance I beg to express my warm thanks—I now venture to ask whether you could further aid us by procuring this season for New Zealand, and forwarding by the San Francisco mail steamer, a supply of the ova of the Californian salmon, Atlantic salmon (*Salmo salar*), the “landlocked” variety (*Salmo sabago*), Californian or rainbow trout, salmon trout, speckled trout, black bass, and whitefish, or of any one or more of these fish.

Arrangements will be made with the agents of the mail steamers in San Francisco to receive and ship any ova that you may send. If you will be good enough to draw on me for any expenses that you may incur for the ova, and for packing and forwarding it to the port of shipment, your draft will be duly honoured.

The United States Commission, Fish and Fisheries,
Washington, D.C.

I have, &c.,
JULIUS VOGEL.

No. 6.

The Hon. the COMMISSIONER of TRADE and CUSTOMS to ACCLIMATIZATION SOCIETIES.

SIR,—

Government Buildings, Wellington, 18th January, 1886.

I have the honour to forward to you copy of correspondence with the Agent-General on the subject of the introduction of fish ova. I shall be glad to receive any suggestions or comments upon it with which you may favour me, and also to learn if your society is prepared to take charge of any part of the ova, some of which is shortly expected to arrive, a telegram having been received from the Agent-General stating that a considerable shipment of salmon ova will be made to Auckland in a fortnight. I append a list of the acclimatization societies to which similar letters to this have been sent. I will be glad, if it be possible, that these societies should act in concert and agree upon united action with regard to treating the ova after their arrival.

I have, &c.,

The Secretary, Acclimatization Society.

JULIUS VOGEL.

LIST of acclimatization societies to which above letter was sent: Auckland, Tauranga, Opotiki Farmer's Club, Poverty Bay, Hawke's Bay, Taranaki, Hawera, Wanganui, Manawatu, Manchester and Kiwitea, Wellington and Wairarapa, Nelson, Marlborough, North Canterbury, Geraldine County, South Canterbury, Greymouth, Waitaki County, Otago, Lake County, Southland.

No. 7.

The PRESIDENT and HONORARY SECRETARY, Waitaki County Acclimatization Society, to the Hon. the COMMISSIONER of TRADE and CUSTOMS, Wellington.

SIR,—

Oamaru, 12th February, 1886.

The Council of the Waitaki County Acclimatization Society, after carefully considering the correspondence between yourself and the Agent-General, enclosed in a circular letter dated the 18th January, 1886, in which you desire to receive any suggestions or comments that our society may favour you with, beg, firstly, to express their appreciation of the efforts you have taken in the matter of the introduction and acclimatization of fish ova to New Zealand. Secondly, they recognize that the various efforts working for acclimatization are not harmonious, but running in at least four different channels, viz.—(1) Efforts by Government, conjointly with the societies; (2) efforts by the Government independent of the societies; (3) efforts by the societies themselves, conjointly and independently; (4) efforts by the Agent-General independent alike of the societies or the Government.

And we consider that it is a matter for very great regret that the Agent-General, while working in this matter for two years—1883 and 1884—kept the Government and the societies in this country in ignorance of his endeavours. It was with a view to getting united action that our society, in a letter dated the 1st September, 1884, suggested to the North Canterbury Society that scheme which Mr. Farr—having knowledge, skill, experience, and giving incessant minute attention, even at the risk of his life, on board ship, and, above all, “enthusiasm,” to quote the Agent-General—so happily and successfully carried out.

Had the great pains taken by the Agent-General been known in this country, and his intention to send out a shipment of salmon ova in a “moist-air chamber” in 1884, we feel convinced that the societies would have waited to see the result of that experiment before going to the expense of sending Mr. Farr Home. Indeed, in suggesting this course of action we were guided very much by the result of the shipment of ova (Loch Leven and Burn trout) sent by Sir James Maitland in the “Ionic,” January, 1884. Our impression is that the success of that shipment was due, not so much to the moist-air chamber, as to the incessant care and minute attention paid to them by Mr. Pringle Stoddart, who happened to be a passenger on that vessel, and was a member of the Otago Acclimatization Society, and possessed of skill and experience in dealing with trout ova, and who had to go to considerable personal expense in getting ice and other necessities for ova while in transit.

We quite agree that the great difficulty lies in getting ova at the right moment; but we submit that that right moment is not early autumn-time at Home, for ova procured in October would be hatching out in from one hundred to one hundred and twenty days—that is, in January and February, two of our hottest months; and we fear that the heat would cause many of the ova to abort or hatch out prematurely, giving a large percentage of weakly fish and cripples. Therefore we urge that Mr. Farr was in plenty of time, arriving Home in early December: and, from a perusal of Mr. Farr's reports, and hearing his statements, we think the Agent-General is hardly generous in attributing undue delay to Mr. Farr; for the latter states (*Canterbury Times*, 9th May, 1885), the Agent-General, “though courteous and willing to assist, pointed out that nothing could be done until after the holidays;” and, further, we feel that he did not get that assistance from the Scottish Fisheries Board that he, as our New Zealand representative, was entitled to: and we do not consider that his success, in the face of all his difficulties, should be attributed to a lucky accident.

On reference to previous shipments of salmon ova to New Zealand we find that, from 1868 to 1878, out of 824,000 ova, only 3,996 survived to be turned out, and they have not been seen since. Whereas in Mr. Farr's shipment of 120,000* nearly the whole arrived safely, and considerably more than half are either distributed or ready for distribution.

The Agent-General states, “there is no need to send any one Home, especially to do what is done every day at fishery establishments possessing the most perfect appliances in the world;” and yet, a little further, “I believe the most constant source of failures has been that ova were sent out which had never been impregnated at all;” and, quoting Mr. Farr, he says, “not 10 per cent. of the ova allotted to the Canterbury Society had ever been fertilized.” If this be the case with ova supplied by fishery establishments having such perfect appliances, and charging on an average £1

* NOTE.—There is apparently some mistake here, Mr. Farr's report of the 12th June, 1885 (Parliamentary papers H.—17, of 1885), shows that he left England with some 198,000 ova.

per 1,000 for the only 10 per cent. impregnated ova—for surely ova supplied to the New Zealand Government through the Agent-General would not be supplied from inferior establishments—no stronger argument can be furnished for the absolute necessity of sending Home an expert, with his heart in the work, who, by catching the fish himself and seeing the ova impregnated himself, would not have to depend upon the statements of employés, nor would he, or we, be in doubt as to the margin of time left before hatching-out, as is the case when, as the Agent-General points out, “eyed” ova are supplied. In the end, it seems much cheaper to send Home an expert. Mr. Farr’s shipment of 120,000 ova at £600 means £5 per 1,000 ova, while £1 per 1,000 for ova only 10 per cent. impregnated raises the price to £10 per 1,000. And again, it would be just as easy, given the facilities on the other side, to catch and spawn and fertilize 1,000,000 ova as 120,000, and at the same expense, or nearly—that is, if arrangements be made, which should be made, that the expert in charge be allowed to catch the fish himself and spawn the ova himself.

The one great fact to which our experience tends is, that not only is skilled care required on both sides, but also during the voyage a sort of wet-nurse between the two maternal hatching establishments.

With regard to the shipment of Californian salmon arriving in large parcels at a cost of only £37, we may point out that the voyage is a short one, only some seventeen days, and through a tranquil sea. Different must be the cost and chances of success of a shipment of ova coming through the Atlantic, and the stormy and the Southern Seas, and taking some forty-four days.

We would also point out that, although in 1878 there were 18,000 Californian salmon (*Salmo quinnat*) turned out into the Pomahaka, 13,000 into the Kakanui, besides other quantities into northern streams, yet during the eight years that have elapsed not one authentic specimen has been seen. It is also stated that, in their own country, these fish are peculiarly liable to die of fungus (*Saprolognia ferax*) after spawning, and do so in large numbers; and also that they do not give the same sport as the *Salmo salar*. Therefore, on the grounds of the risk of introducing a species of salmon liable to disease, and of the risk of its interbreeding with and degenerating the *Salmo salar*, we are of opinion that it is inadvisable to introduce the *Salmo quinnat* to New Zealand. The ova, however, of the Atlantic and Land-locked salmon, together with the ova of the various kinds of American trout, may be introduced with advantage.

From the information supplied by the Agent-General, we think it useless to attempt to introduce lobsters, crabs, or herring at present.

In connection with this subject, we would call your attention to the very inefficient protection afforded to salmon in the existing fishery laws of New Zealand, whereby opportunities are offered for their wholesale destruction by fishermen in tidal waters. At the present time these are not under the immediate control of any one. The fishermen obtain their licenses from the Customs Department. In many cases they have not even licenses, and, under the pretext of netting mullet and flounders, they already destroy large quantities of trout in the tidal and adjacent waters; and, under the terms of their licenses, they claim the privilege of netting three miles east and west of high-water mark. Unless the netting of fish in tidal waters be placed under the control of some local body interested in the preservation of imported fish, it must necessarily follow that all the efforts made to introduce salmon will be thwarted. And, further, under the various Acts for the preservation of trout and salmon, and “The Dynamite Act, 1878,” great opportunities are accorded for the destruction of salmon and trout by the use of any net or other poaching device, or even dynamite, for the use of these devices is permitted and sanctioned by the clause in each of these Acts which states that the Act does not apply to waters the property of any private person. In the absence of anything to the contrary, this is held to apply to those rivers and streams which immediately bound or run through the lands of private persons.

In the fishery laws of the American States private waters are accurately defined—*e.g.*, in New York they are called “private ponds,” and, as such, are specially dealt with; in Massachusetts there is a clause referring to the proprietors or lessees of any “natural or artificial pond;” in Michigan, “taking fish from any private pond, stream, or spring;” in New Jersey the clause states, “It shall not be lawful to take fish in the Rancocus Creek and extending up the said creek to its beginning, including the coves and branches belonging to it,” &c.; in New Hampshire the clause which permitted the owner of the surrounding land to kill and catch fish was repealed in 1868, and the private waters specially named; in Rhode Island private waters are defined as private ponds or streams which are not private ponds or streams stocked at the expense of the State; in Kansas private fish reserves are those owned and used for the propagation of fish; Connecticut—private ponds, streams, or preserves; Vermont—private ponds, streams, or preserves where fish are bred artificially, cultivated, and maintained by owners; Nebraska—any private pond not exceeding ten acres; Pennsylvania—such pond or streams only as shall be used or improved by the owners or lessees for the propagation of fish; Maine—private waters are ponds or streams for the artificial culture of fish.

We therefore suggest that the Fisheries and Dynamite Acts be amended in this direction, and that “waters the property of any private person” be more accurately defined.

HARRY A. DE LAUTOUR, President,
JAS. FIELD CRAWFORD, Honorary Secretary,

The Hon. the Commissioner of Trade and
Customs, Wellington.

Waitaki County Acclimatization Society.

No. 8.

Mr. C. R. BUCKLAND to Mr. HOLDSWORTH.

SIR,—

San Francisco, 12th February, 1886.

In accordance with the telegram from Mr. Gray dated the 13th October, 1885, I have to request you to see that the fish ova—a million eggs of whitefish forwarded by the “Alameda” to

the New Zealand Government—are properly cared for on the voyage. I have personally superintended their unpacking and repacking here, and have arranged for the shipment of ice necessary for their safe transportation. I will personally instruct the chief steward of the "Alameda" as to their care, and enclose you a copy of the instructions received from the United States Fisheries Commission.

CHAS. R. BUCKLAND,

Acting Resident Agent for the New Zealand Government.

Mr. Holdsworth, New Zealand Government Mail-agent, steamship "Alameda."

To Chas. R. Buckland.

Northville, Mich., 5th February, 1886.

I SHIP you to-day by express one million whitefish eggs for Sir Julius Vogel, New Zealand.

To Postmaster-General, New Zealand.

San Francisco, 12th February, 1886.

TWENTY boxes whitefish ova, "Alameda."

BUCKLAND.

Mr. F. N. CLARK to Mr. C. R. BUCKLAND.

Northville, Mich., 5th February, 1886.

SIR,—

Fearing that our whitefish eggs will be too far advanced to ship on steamer of the 13th March, I ship you one million by express to-day, to go by first steamer, 13th February. Should this lot fail to reach you in time, or should they be in bad condition—that is, frozen or overheated *en route* to you—there will still be another chance left. I thought best to improve the first chance, thus giving us two chances instead of one. We have still younger eggs than those we ship to-day—too young, in fact, to hand-pick and prepare for shipment. These will probably be in just the right stage of development for steamer of the 13th March; and another lot will be sent in case the first fails, and the Commissioner so advises.

Chas. R. Buckland, San Francisco, Cal.

FRANK N. CLARK.

EXTRACT from Letter from Acting Resident Agent at San Francisco for New Zealand Government, *re* Shipment Whitefish Ova by "Alameda."

I also enclose copies of telegraphic despatches between Mr. F. N. Clark, of the United States Fisheries Commission, and myself, relative to the shipment of the whitefish ova for Sir Julius Vogel. These will be received here on the 12th instant, the day prior to the departure of the "Alameda," and will leave but little time for the examination of the eggs, and repacking in accordance with the instructions that I have received. I have made every arrangement for their care at this end, and will use every endeavour to insure their arrival in good condition at Auckland. Without definite instructions, I will use my own judgment as to the expenses that it will be necessary to incur in order to attain the desired result—of course with a due regard to economy.

I mail you two copies of to-day's papers, which refer to the shipment and repacking of the whitefish eggs. These arrived here on the 11th instant, when I at once unpacked and repacked them, in accordance with the instructions received from the United States Fish Commissioners. They appeared to be in good condition, and I hope will arrive safely at Auckland.

I personally superintended the packing, and engaged the services of a gentleman who was acquainted with the business to assist me. In future, I shall be able to do all such matters by myself. I thought it best, however, on the present occasion to employ a competent person. I enclose you a statement of accounts and expenses incurred, for which I have drawn upon the New Zealand Loan and Mercantile Agency in this city. I have handed them all the receipts for expenses incurred, and which you will receive in due course. The amounts of my drafts are—23rd January, \$30.80; 13th February, \$109.05. I hold duplicate receipts for the various items specified. The item signed by myself was for cash paid in going to the ice-works by car; also for the workmen who assisted me in preparing the different packages. They are now all on board, and will be properly cared for. I paid the chief steward of the steamer \$10, as he has charge of the ice-house, and will give particular attention to their care. This expenditure I considered would be an advisable one. In accordance with your telegram to Mr. Creighton, I have instructed your mail-agent to attend to them on the voyage. The ice account has been paid through the Messrs. Spreckels, their charge being \$12.50 per ton; while the ice company sent me an account at \$20 per ton. This effects a saving of \$15 (£3) on the ice order. Messrs. John D. Spreckels and Brothers make no charge for the freight of the fish eggs; and I am indebted to them for special instructions as to the care of the eggs, which have been given to their officers.

[Extract from *San Francisco Chronicle*, 13th February, 1886.]

FISH-EGG SHIPMENT.—ARRIVAL OF ONE MILLION FOR NEW ZEALAND.

THE express car attached to the overland train which arrived at the Oakland mole yesterday discharged a large box which bore the address, "Sir Julius Vogel, Wellington, New Zealand, care of Charles R. Buckland, San Francisco." Several placards of more or less official appearance notified those interested that the box should not under any circumstances be turned over or laid on its side; and, further, that its contents were 1,000,000 whitefish eggs, from the United States Hatchery at Northville, Michigan, *en route* to New Zealand. A large ice-wagon, containing huge squares of frozen water, was in readiness, and the box was quickly transferred from the express car to the vehicle. Charles R. Buckland, Resident Agent of the New Zealand Government, with two gentlemen, experts in fish-egg transportation, followed the ice-wagon on board the ferry, and on arriving on this side the precious freight was at once transferred to the Union Ice Company's icehouse on Fourth Street. There the box was opened, and the twenty trays of whitefish eggs were removed and carefully examined. Each tray was covered with a coarse netting, which in turn was covered with live moss, saturated with ice-cold water. The instructions sent out by United States Commissioner

Spencer and Superintendent Clark were to the effect that the trays should be examined only in a temperature of less than 35°, and each egg having a white spot on it should be removed. The dead eggs were those of a yellowish colour, which were easily recognized; and careful hands quickly removed them with tweezers. The temperature of the quarters in which the work had to be done was not at all pleasant, but it is believed the labour, which occupied nearly three and a half hours, was successfully performed. The eggs were repacked, and are now in the icehouse, from which they will be taken this afternoon just prior to the departure of the steamer for the colonies. Mr. Buckland ordered two tons of ice sent on board the steamer for the purpose of having every precaution taken to insure the safe transit of the eggs, and the officers of the steamer will pay particular attention to the freight, so that the eggs may arrive in good condition. This is the third attempt to send fresh eggs to the Australian Colonies; and the former failures were occasioned only by negligence in transportation after they had been discharged from the steamer at the Australian ports. This consignment is under the particular direction of Sir Julius Vogel, and from the very careful arrangements made it is to be hoped the eggs will arrive at Auckland in good condition.

No. 9.

The Hon. the COMMISSIONER of TRADE and CUSTOMS to the AGENT for New Zealand Government, San Francisco.

(Telegram.)

WHITEFISH ova arrived putrid. Believe neglected on board.

Wellington, 12th March, 1886.

VOGEL.

No. 10.

Mr. S. C. FARR to the Hon. the COLONIAL TREASURER.

SIR,—

Wellington, 12th March, 1886.

I have the honour to report and comment upon the recent shipment of whitefish ova forwarded by the United States Fish Commission, Washington, and shipped at San Francisco for the New Zealand Government by Mr. Buckland on board the Royal mail steamer "Alameda."

Telegram dated the 15th February, 1886, stated that "twenty boxes" of ova had been shipped; but there was no statement of the number they contained—it might have meant thousands or millions, as boxes vary in size according to the packer's opinion. I mention this because of the difficulty in allotting numbers to suit the capacity of our respective New Zealand hatcheries; and I venture to suggest that when it is intended to import ova it should be a request to those forwarding it to furnish an approximate of the numbers sent or the capacity of the compartments in which it is packed. Either would be simple, and facilitate the distribution so long as there are a number of societies to share in the importations; but if a central establishment could be arranged for, these details would, of course, be unnecessary.

As desired and arranged for by you, I left Christchurch for Auckland on the 23rd February—travelling by the steamer "Hawea" to Wellington, thence by the steamer "Hinemoa" to Manukau Harbour—to await the arrival of the mail-steamer, which came alongside the wharf in Auckland on the 7th March, at 9 a.m. I at once went on board and inquired for the ova. After waiting for some little time the cook was sent to me, who at once informed me that he had had a great deal of trouble with the package. I inquired what had caused the trouble. He replied it was by being compelled to move it about and repack in ice, after taking the meat out from time to time. He then took me to a chamber on deck, the door of which he opened, and pointed to a package which could be clearly seen among carcasses of meat (ship's stores) and blocks of ice. From what I saw and smelt I said to Mr. Parker (who had been appointed by Mr. Hill, the Customs collector, to render what aid was necessary in the transshipping), "It is my opinion that it is worthless; but we always hope for the best in such matters until the worst is revealed."

I may here state the exact position I found the package in—which was a series of frames (not boxes) 18in. square and about 1in. thick, resting one upon another, and secured together with narrow battens; on one side of each frame was tacked a piece of calico, upon which the ova was placed, and over it white scrim; the frame was then filled in with moss. Perfect packing so far; but, instead of its being placed in an insulated case, as it should have been, it was resting upon something at the bottom of the chamber anything but level, close to the outer side, next an alley-way. On the other side rested a large block of ice, on the top of a smaller piece. The side opposite the door was quite exposed; so that two sides only were in contact with ice. If this apparent neglect had been the only cause for complaint some little hope of success might have been indulged in; but the offensive gas arising from melting ice amid stale meat necessarily permeating the whole package was sufficient to dispel all hope, and crush the ardour of the most sanguine and enthusiastic pisciculturist. I gave the cook the customary bonus for his trouble, but not so large a sum as I should have done if it had been well cared for. He said he had carried out the only instructions he had received—"to keep plenty of ice about them."

That some person is to blame there can be no doubt. To prove which is only to imagine the package of ova placed in a house on deck with an alley-way one side, through which, on the voyage in the tropics, a current of continuous hot air must necessarily pass, causing premature hatching, followed by foul decomposition. This would apply to any kind of ova, but more especially to the delicate ova of the whitefish.

The package was immediately conveyed by the Customs launch to a van placed at my disposal by the railway manager, packed in ice, and then taken to the wharf at Manukau by a special train, and at once put on board the steamer "Stella." We left Manukau and crossed the bar at 4 p.m.

It will, perhaps, be well for me to explain why I decided to take the doubtful packet on. In the first place, there was no society nearer than Nelson that had agreed to accept a portion of the shipment. Secondly, the postmaster at Auckland had arranged, previous to the arrival of the mail-steamer, that the "Stella" should bring down the Nelson and Picton portion of the mails. Consequently I resolved not to open the package until reaching Nelson, concluding that if a few survived they might in a short time be placed in the hatchery; and, further, that those who had expressed an interest in the importation might be present to verify its condition when opened. I trust the Government will approve the motive which prompted me thus to decide. We arrived off the Boulder Bank at Nelson on the 8th instant, at 6 p.m., but the tide did not serve for the vessel to proceed to the wharf, and I was taken ashore in the pilot boat. Three members of the Nelson Acclimatization Society returned with me, and the package was at once opened; when my anticipations were painfully realized: the whole of the frames were carefully examined in every part, but only six eggs could be found having a globular form, and those quite in the angle of one frame; a close observation decided their utter worthlessness. As a fact, I may mention that the appearance of the layer in each frame gave evidence that they had been beautifully packed thus far, hatched out *en route*, the eyes being visible; hence the cause of putrefaction, the effluvia arising therefrom being most offensive. The disappointment, after all the trouble and anxiety, was most irritating, and especially so to the members of the Nelson society, who had incurred expenses in providing every requisite for conveying their portion to the lake.

In conclusion I would like to add, the above is a brief memorandum of another failure in the many attempts to introduce fish-food into the waters of New Zealand, and a further proof that the delicate embryo of fish require constant, careful, and enthusiastic attention, as well as a practical and scientific knowledge of requirements during transit, for they are not marbles, or even glass beads, which often receive more care.

I have, &c.,

S. C. FARR.

The Hon. Sir Julius Vogel, K.C.M.G., Colonial Treasurer, Wellington.

No. 11.

The Hon. the COLONIAL TREASURER to the Hon. S. F. BAIRD, Washington, United States.

SIR,—

Government Buildings, Wellington, 27th March, 1886.

Referring to my letter to you of the 10th October last asking if you could procure and forward fish ova to this colony, and to the shipment of one million whitefish ova forwarded by the San Francisco mail-steamer "Alameda," I beg to express to you the warmest thanks of the New Zealand Government for your having so kindly and promptly acceded to my request.

I greatly regret, however, to have to inform you that the ova, although packed with the greatest care and in the most approved method, arrived in this colony in a putrid condition, owing, it is believed, to want of proper attention on board the "Alameda." I trust, should you be kind enough to forward any further shipments, that those on board the steamers that they may be sent by will have sufficient public spirit to take more care of this valuable and interesting freight; and I will take care to see that this is done.

I have not as yet received any accounts for any charges made by you in connection with the ova, and I hope that you will not fail to draw on the New Zealand Government for any sum that may be due. I sincerely trust that the fate of this shipment will not deter you from making further shipments; and, with renewed thanks,

I have, &c.,

JULIUS VOGEL.

The Hon. Spencer F. Baird, Commissioner of Fish and Fisheries,
Washington, D.C., United States, America.

No. 12.

The AGENT-GENERAL to the Hon. the COLONIAL SECRETARY.

SIR,—

7, Westminster Chambers, London, S.W., 29th December, 1885.

I resume my report of what has been done respecting fish ova.

1. *Salmon Ova.*

My arrangements for getting ova from the Rhine and Switzerland are progressing satisfactorily, and I hope soon to make the first shipment. Mr. Searle has arranged for 60,000 Swiss ova, at 12s. per 1,000, and I may perhaps even get 100,000 more. From the Seewiese Fishery (Bavaria) I shall probably get 100,000, costing only 7s. per 1,000, and possibly may get 100,000 more. I am also getting from Seewiese some Bavarian brook-trout—*Salmo fario*—and great lake-trout, which you will, no doubt, be glad to have in New Zealand, as well as the Loch Leven and other trout already acclimatized. The spawning season has not been a good one on the Rhine, for the river was so low in the autumn that the net-men caught great numbers of fish; but now there is plenty of water. Mr. Searle will receive the Swiss ova and take charge of them until fit for shipment. The Bavarian ova will come ready packed, and be immediately transferred to the ocean-steamers.

As to the Tyne, after some correspondence with Mr. Ridley, Chairman of the Tyne Conservancy Board, he advised me not to work in that river this season, but wait till next year.

I applied to the Conservancy Board of the Ribble River for leave to take ova, and engaged Mr. Ramsbottom, son of the late well-known pisciculturist of Liverpool, to take them; but I hardly expect to get any there this season.

I am still corresponding with the Solway Fishery, Scotland, as to a supply of ova there.

The Government are again greatly indebted to Sir James Maitland for his invaluable assistance. As soon as the Tay District Board had filled their own hatcheries, they permitted their superintendents and men to take ova for us, and Sir James immediately sent his own men there to help. I am glad to tell you that about 180,000 ova have now arrived at Howietoun Fishery, where Sir James will take care of them until shipment. By a fortunate accident he had thirty empty boxes at the Howietoun hatching-house, most of which were to have been filled on the very day that the Tay District Board gave their permission. Sir James has been experimenting in freezing fresh ova directly after impregnation, and they remained bright and clear until thawing. Thereupon he proposed to me an experiment in freezing eggs dry in the London refrigerators; and I have placed a quantity in the refrigerators at the docks for the purpose. This will help to solve the problem of how far ova will stand the cold of the refrigerators on board ship.

In Mr. Cholmondeley-Pennell's book on fishing, just published in the Duke of Beaufort's Badminton Library Series, he says he is not sanguine of success with ova placed in ocean-steamers' refrigerators, as in that temperature he thinks the eggs are likely to perish.

You may perhaps have seen that, in the very interesting report of the Tasmanian Fisheries Department for 1885, Mr. Saville-Kent speaks of having two hundred young salmon in a vigorous condition of development, from ova imported by the steamer "Yeoman," and of proposing to keep them until they reach the smelt condition and are ready to descend to the sea, when he will gradually acclimatize them in the salt-water-tanks of his hatcheries, preserving them there if possible until they are ready for migrating back to the rivers for spawning. Mr. Saville-Kent adds that, if this experiment succeeds, a breeding-stock of salmon might be permanently retained, and the necessity of importing further supplies of ova from England cease. I was struck, however, by another paragraph in the same report, where he says that "his practical acquaintance with the acclimatized salmonidæ in the lakes and rivers of Tasmania had further confirmed his opinion that no true salmon had as yet been established." At the same time he says that the prospect was more promising than at any time previously, as the safe transport of ova by the steamer "Yeoman" had resulted in the production of over thirty-five thousand healthy fry.

As the Swiss and Bavarian ova that I am sending will all be "eyed," I may remark that Mr. Kent says that out of a total of 150,000 salmon ova originally shipped, the most successful results were found in the portion which had been placed in a private hatchery, and approached there to the "eyed" condition; and that, as out of 10,000 of this series almost every egg hatched out, he had recommended the Salmon Commissioners to import only "eyed" ova in future.

2. *Lobster and Crab.*

The information I gave you in my letter of the 18th November (No. 1,418) has been confirmed by further investigations made by Her Majesty's Inspector of Fisheries. Mr. Berrington still thinks that the only way of introducing lobsters is to send out live fish; and that if these succeed, crabs might then be attempted. You are, no doubt, aware that the Tasmanian Government are now taking steps in a very thorough way to bring out live lobsters, with complete arrangements for tanks and so forth on the voyage. Temperature is a material point, and ought not to be below from 50° to 55°: at the Brighton Aquarium it is kept at about 52° or 53°. No ice or ice-water must be introduced into the salt water in the tank, as a very small admixture of fresh water (even so little as is produced by rain) would kill the fish. A contrivance would also have to be arranged in the shape of a "fiddle" at the bottom of the tank, to prevent injury from the motion of the ship.

Lobsters must be fed on fish, though (unlike crabs) they will eat it when tainted; but a quantity of recently-caught fish for food should be taken out in the ship's refrigerator. They will also eat dried fish, some of the salt being first washed out. The salt water in the tank must be renewed occasionally by sea-water at the right temperature.

Mr. Berrington was good enough to ask Mr. Lawler, who has charge of the fish at the Brighton Aquarium, and who is in communication with Mr. Saville-Kent about sending lobsters and crabs to Tasmania, whether he would undertake the arrangements for sending lobsters to New Zealand, if you decided to incur the expense. Mr. Lawler has been in charge of the fish at the Aquarium for fifteen years, and has hatched both lobster and herring there, and has also experimented for three years on herring ova. As soon as I can I shall go down to the Aquarium and see him.

3. *Herring.*

I have had a long consultation with Professor Cossar Ewart about the best steps to take for the introduction of the herring; and we now see our way to a series of careful experiments still under consideration.

We shall get a supply of ova in a particular bay on the west coast of Scotland in February and March; and, as it has now been ascertained that the hatching can be delayed for forty to forty-five days, we shall take care that the ova are procured at a time to fit in with the despatch of the ocean-steamers. There will not be much difficulty in this, as millions of herring come to that particular bay for spawning, and ova can be got in plenty on almost any day that the weather permits.

It fortunately happens that Professor Ewart will be able to give his personal attention to the work at that time; and he is very glad to do so. He will presently draw up complete instructions for the guidance of those whom you may appoint to receive the ova on the arrival of the steamers, so that the best chance may be afforded of success; and as soon as we have settled these instructions I will take care to let you know. In the meantime, may I ask you to ascertain how far any hatcheries to which herring ova may be sent are from a quiet sheltered bay, where a well-boat could be stationed without fear of being much knocked about, even by the tides.

The Hon. the Colonial Secretary, Wellington.

I have, &c.,
F. D. BELL.

No. 13.

The AGENT-GENERAL to the Hon. the COLONIAL SECRETARY.

SIR,—

7, Westminster Chambers, London, S.W., 15th January, 1886.

Since writing to you on the 29th December (No. 1,600) I have been engaged in making arrangements for sending you the salmon ova got from the Tay. I regret to say that I am very doubtful now whether any Rhine ova will come after all.

Having regard to the risk which undoubtedly exists of ova not living in the extreme cold of the steamers' refrigerators, and to the misfortune it would be, in that event, if all that has been done should be thrown away, I decided to send only a small portion in the freezing-chambers, and to place the bulk in an icehouse specially designed for the purpose, sending out a man in charge of it for insuring a supply of ice to the trays. Sir James Maitland will pack the ova, and they will go to the "Ionic" in a fortnight. I have accordingly sent you a telegram to that effect, using the ciphers in your despatch of the 15th of August. Sir James Maitland examined all the eggs carefully two days ago, and found their impregnation right. Allowing 10 per cent. for blind eggs and others injured by spawning together, there ought to be 160,000 eyed ova; and Sir James is confident that if they are not disturbed on the voyage, but allowed to remain in the boxes till they arrive at their destination, a good success is certain.

I have arranged with the Shaw, Savill, and Albion Company that, if required, ice should be available on board the "Ionic," at Auckland, for the ova; but you will perhaps allow me to suggest that as soon as you get this letter a telegram should be sent to the refrigerating companies at all the ports, to make sure that there is plenty of ice at hand.

The Hon. the Colonial Secretary, Wellington.

I have, &c.,

F. D. BELL.

No. 14.

The Hon. the COMMISSIONER of TRADE and CUSTOMS to the AGENT-GENERAL.

SIR,—

Government Buildings, Wellington, 12th March, 1886.

I have the honour to acknowledge the receipt of your letters of the 29th December and 15th January last, addressed to the Colonial Secretary, on the subject of fish ova, and I beg to express my thanks to you for the valuable and interesting information contained therein.

I have taken the best measures that I can for insuring the safe distribution of the salmon ova which you have forwarded by the "Ionic."

With reference to the question of introducing lobsters and crabs, I think that it would be advisable to await the result of the experiments proposed to be made in sending those crustacea to Tasmania before taking any steps to introduce them to New Zealand.

There are at present, so far as I can learn, no hatcheries that would be suitable for hatching out herring; but the necessary steps for establishing one will be taken as soon as Professor Ewart's instructions hereon have been received. I trust that these will be forwarded to the colony before the ova arrives.

On the 10th instant I received the following telegram from you: "Herring ova 'Ruapehu.' Professor Ewart strongly wishes send scientific assistant therewith. Instruct whether. Please reply immediately." To which I replied, "Herring ova: If expense reasonable, and you approve, send assistant."

The Agent-General for New Zealand, London.

I have, &c.,

JULIUS VOGEL.

No. 15.

The AGENT-GENERAL to the Hon. the COLONIAL SECRETARY.

SIR,—

7, Westminster Chambers, London, S.W., 27th January, 1886.

I am glad to inform you that I have shipped over 200,000 salmon ova in the steamer "Ionic." The ova were packed by Sir James Maitland himself at Howietoun yesterday, in boxes made for the purpose; and, as I informed you by the last mail, I have had a chamber put up adjoining the ship's refrigerator, in which eight of the boxes have been packed, leaving a ninth box separate. I have also placed two boxes of trout ova in the ship's refrigerator, in order to afford a test as to whether ova can survive the amount of cold there. If you will be good enough to have all the boxes reshipped to me the expense of them will be saved. I transmit herewith copy of the instructions given to the attendant whom I am sending in charge. Dr. Posnett, the newly-appointed Professor of Classics at Auckland University College, has very kindly consented to look after the filling of the ice-trays in the chamber, in order to insure that there shall be no tampering with the ova during the voyage.

After we had put the salmon ova on board the "Ionic" we inspected the box of ova which I had placed a month ago in the freezing-chamber at the Victoria Docks, and which had remained there ever since in a temperature of 18° Fahr. We found that, although most of the eggs had been killed, a large proportion were alive and apparently uninjured. We replaced the box in the refrigerator, and shall keep it there for another fortnight, which will allow of the ova being in that temperature for a time equal to the time occupied on a voyage to New Zealand. As to this I shall address you later on.

I am sending you a telegram to inform you of the number of ova in the "Ionic," in order that you may have as much time as possible to arrange for their distribution.

I trust the Government may be pleased to write direct to Sir James Maitland in acknowledgment of the immense pains he has taken throughout; and it would be a great pleasure to myself if you would allow me to procure a suitable piece of plate for presentation to him in recognition of the great services he has done to the colony.

The Hon. the Colonial Secretary, Wellington.

I have, &c.,

F. D. BELL.

No. 16.

MEMORANDUM from the AGENT-GENERAL to the Hon. the COLONIAL SECRETARY.

7, Westminster Chambers, London, S.W., 28th January, 1886.

SALMON OVA.—Herewith I transmit copy of correspondence giving the conditions under which I have engaged Mr. F. W. Paxton to proceed in the "Ionic" in charge of the shipment of salmon ova by that steamer.

F. D. BELL.

MEMORANDUM from the AGENT-GENERAL to Mr. FRANK PAXTON.

7, Westminster Chambers, London, S.W., January, 1886.

REFERRING to our interview of to-day, I have to inform you that the Agent-General is prepared to engage you to proceed in the steamer "Ionic" in charge of the salmon ova which he is sending out by that vessel for the New Zealand Government. In consideration of this service the Agent-General will provide you with a third-class passage by the "Ionic," and a gratuity of £5 will be paid to you by the Government of New Zealand provided the ova is successfully landed and you have performed your duties in connection therewith to the satisfaction of the Government. You will receive instructions as to your duties before you leave. You must understand that if you return to England you will have to provide for your own passage thereto.

W. KENNAWAY, Secretary.

Mr. F. W. PAXTON to Mr. W. KENNAWAY.

11, St. George Place, Northampton, 23rd January, 1886.

SIR,—In compliance with your wish, I write to say I am willing to undertake the office placed before me, and you may rely upon my doing my duty as far as lies in my power.

I have, &c.,

Mr. W. Kennaway.

FRANCIS WILLIAM PAXTON.

MEMORANDUM from the AGENT-GENERAL to Mr. F. W. PAXTON.

7, Westminster Chambers, London, S.W., 27th January, 1886.

WILL you be so good as to deliver to Dr. Posnett, who will give this to you, the key of the ice-house, applying to him for it whenever it is required for supplying ice, &c. You will be pleased also to attend to Dr. Posnett's instructions in respect to the shipment of ova.

W. KENNAWAY, Secretary.

MEMORANDUM from the AGENT-GENERAL to Mr. F. W. PAXTON.

28th January, 1886.

SALMON OVA.—Herewith I enclose copy of instructions respecting the management of salmon ova during the voyage. A copy of the same has also been forwarded to Dr. Posnett. I have to add that your contract-ticket, which I handed to you on Wednesday, provides for your passage to Otago, the last port to which the "Ionic" goes: you will therefore remain on board in charge of the salmon ova until you are relieved by the representative of the Government in the colony, and receive his permission to leave the vessel.

W. KENNAWAY, Secretary.

SALMON-OVA REFRIGERATOR.

DESCRIPTION.—First, the ova refrigerating-chamber (lettered A) consists of an outer refrigerating-wall, and inside of the chamber provision is made for containing ice, which is here called the ice-well, fitted with doors (marked B). The remaining space of chamber (marked C) contains eight cases, containing the salmon eggs (marked D). Below the ice-chamber is a well to receive melted ice (marked E), fitted with draw-off tap (marked F).

Instructions.—It will be necessary for the attendant in charge to examine the ice-well (B) before the commencement of the voyage, to ascertain that it is full of pulverized ice. If not full, he must have it filled. Afterwards he will have to keep it filled, taking care to close all the lids or doors. The ice-water must be drawn off at least once a day from the well marked E, taking care to turn off the tap (F). The boxes containing the salmon eggs (marked D) will have to be very carefully drawn out by the rope handle about 9in., up to where the lid can be opened, and the tray filled with pulverized ice. As each tray is filled, the box is to be pushed back into its place, taking great care not to give it any shock. The time for filling the ice-well (marked B), and also the trays of the boxes containing the ova (marked D), will be best defined by careful watching of the state of the ice. Probably the ice will not require to be replenished—except in the tropics—oftener than every four or five days. Great care must be taken to keep the room containing the refrigerating-chamber securely locked up; and on no account is any one to be allowed to interfere with the attendant, or to examine the ova-boxes or their contents. Dr. Posnett will keep the key of the chamber, and be present at the periodical filling-up of the ice in the trays.

WALTER KENNAWAY, Secretary.

No. 17.

The AGENT-GENERAL to the Hon. the COMMISSIONER of TRADE and CUSTOMS.

(Telegram.)

London, 28th January, 1886.

OVER two hundred thousand salmon ova, "Ionic."

No. 18.

The AGENT-GENERAL to the Hon. the COMMISSIONER of TRADE and CUSTOMS.

(Telegram.)

London, 15th January, 1886.

CONSIDERABLE shipment salmon ova to Auckland by "Ionic," fortnight.

No. 19.

The Hon. the COMMISSIONER of TRADE and CUSTOMS to the AGENT-GENERAL.

SIR,—

Government Buildings, Wellington, 12th March, 1886.

I have the honour to acknowledge the receipt of your Memorandum No. 113, of the 28th January last, in which you transmit copy of correspondence setting forth the conditions under which you engaged Mr. F. W. Paxton to proceed in the "Ionic" in charge of the shipment of salmon ova by that steamer. That arrangement seems to me to be an excellent one.

I have, &c.,

The Agent-General, 7, Westminster Chambers, London, S.W.

JULIUS VOGEL.

No. 20.

The AGENT-GENERAL to the Hon. the COLONIAL TREASURER.

SIR,—

7, Westminster Chambers, London, S.W., 9th February, 1886.

I have to acknowledge the receipt of your letter of the 31st December last, No. 439, relating to the shipment of fish ova.

I beg permission to express my acknowledgments for your explanation, and to assure you that nothing was further from my intention than to make any personal complaint in my letter last October of the course the Government had taken in the matter. But, having been long impressed with the enormous importance to New Zealand of acclimatizing the salmon, I had given some study to the subject; and I could not see with pleasure so great an expense being incurred in sending Home Mr. Farr, when it was in reality quite unnecessary to send a special agent at all. As it is, I can only be very glad now that I have been able, with the invaluable assistance of Sir James Maitland, to send you so large a shipment this season at so small an expense.

I regret to be obliged to confirm what I lately said to you—that, notwithstanding repeated promises, I see no chance now of getting any Rhine ova this year.

I am now in constant communication with Professor Cossar Ewart about the herring experiment; and we have designed the plan of the icehouse he will want. On this subject I shall be addressing you again shortly.

I beg that you will be pleased to accept my excuses for having addressed my letters respecting ova to the Colonial Secretary instead of yourself. If you will turn to your letter of the 15th August, 1885, you will see that it was only dated "Wellington," and, as I did not know the subject had been transferred to the Customs Department, I merely supposed that you had signed the letter for the Hon. the Colonial Secretary. In future, all letters relating to it shall be properly addressed to yourself.

I have, &c.,

The Hon. the Colonial Treasurer, Wellington.

F. D. BELL.

No. 21.

The AGENT-GENERAL to the Hon. the COMMISSIONER of TRADE and CUSTOMS.

(Telegram.)

London, 18th March.

HERRING ova: Between two and three millions, "Ruapehu." Please prepare.

No. 22.

The HONORARY SECRETARY, Wellington and Wairarapa Acclimatization Society, to the Hon. the COLONIAL TREASURER.

SIR,—

Wellington, 25th March, 1886.

On the arrival of the "Ionic" the Marine Department handed me one case of salmon ova (No. 86) and one case of frozen trout ova (No. 36), which I took to the Masterton hatching establishment by the afternoon train on Monday, the 23rd instant, together with about 2cwt. of ice.

On opening the case of salmon ova, I found a large part of them looking bright and healthy; so, after lowering the temperature of the water with ice, placed the ova in the hatching-boxes, picking out 3,150 dead ones. I was informed that there were about twenty thousand ova in the case; but, judging from appearance in the boxes, I do not think that there were so many. Assuming, however, that there were, this would leave about 16 per cent. of dead ones in the case.

The impregnation of the ova in the case I have received seems unusually good; but I should like to call attention to what seems to me a fault in all British-packed eggs—i.e., the thick, heavy, felt-like coating of moss between the layers of ova. I feel sure that the ova would carry more easily and with less loss if a small quantity of moss was carefully “teased out” over the eggs in a thin light layer. The heavy felt-like coating sets tightly on top of the ova, and often produces—especially in the lower layers of eggs—a kind of fungoid growth like a fine spider’s web that seems to destroy the ova—generally where the drip from the ice is greatest. The condition this case arrived in speaks well for the careful way the ova must have been handled on shore and looked after at sea.

The extremely interesting experiment of sending a box of trout ova in the refrigerator is, I regret, a total failure.

The sawdust round the inside box was dry, and the box exceptionally well packed. Within, the moss was frozen into a solid mass, the trays all being stuck together; and on opening a layer it was evident that the ova had been frozen to death. There was no sign of life, and the appearance presented was like layers of light-yellow transparent unfertilized ova, with one side of each egg slightly fallen in. A coating of hoar-frost surrounded each egg. The animal matter was in good condition, and what looked like traces of yellow dead fish could be seen in many of the ova.

I tried several experiments, such as thawing very slowly in iced water, thawing in the air, &c., but could detect no sign of vitality with a glass. The ova turned opaque at once on being placed in water, but the indentation in the side swelled out and each egg resumed its proper shape. There are about a dozen ova that have not turned opaque, and I have left them in a hatching-box to see if there is any possibility of vitality.

I think that this experiment has demonstrated plainly that the intense cold evolved in the freezing-chamber is fatal to life in ova, even when well insulated and protected, as in the case of the box I received. When sending to England for more salmon ova, I would venture to suggest that it would be very desirable, and not give much more trouble, if a quantity of sea- or salmon-trout ova were sent out. They are a most valuable fish, and well suited to our waters. The Californian or rainbow trout (*Salmo iridens*), from America, would also be a very valuable fish in our North Island rivers, as it is said to stand a higher temperature than most other kinds, and its introduction seems to have been a great success in Japan.

I have much pleasure in reporting that the varieties of salmonoids at the ponds—brown trout, Loch Leven trout, Scottish burn-trout, American brook-trout, and a few salmon-trout—are thriving exceedingly well. There are about three hundred of last year’s salmon in the ponds—small lively fish, feeding well.

Should you ever visit Masterton, I venture to think you would feel interested in looking over an establishment where I think more work has been accomplished with less money than in any other establishment of the kind in the colony.

I have, &c.,

The Hon. Sir Julius Vogel, K.C.M.G.,
Wellington.

ALEX. J. RUTHERFORD,
Hon. Secretary Wellington and Wairarapa
Acclimatization Society.

No. 23.

CHAIRMAN, Otago Acclimatization Society, to the Hon. the COMMISSIONER of TRADE and CUSTOMS.

(Telegram.)

Dunedin, 29th March, 1886.

GLAD to inform you we find 12,000 good ova in our case, just commencing to hatch.

J. P. MAITLAND.

No. 24.

CURATOR, Southland Acclimatization Society, to the Hon. the COMMISSIONER of TRADE and CUSTOMS.

(Telegram.)

Invercargill, 27th March, 1886.

CONDITION of ova very satisfactory: 15,500, or 75 per cent., good.

A. N. CAMPBELL.

No. 25.

SECRETARY, Nelson Acclimatization Society, to the Hon. Sir J. VOGEL.

SIR,—

Nelson Acclimatization Society, 27th April, 1886.

I have much pleasure in informing you that the salmon-hatching in the Nelson Society’s boxes has been most successful. Out of the eighteen trays of ova put in the boxes only 2,500 bad eggs have been taken. The temperature ranged from 52° to 60°. The young fry are very lively and healthy-looking, and they were fed for the first time yesterday. As I do not know the number of eggs in each tray, I am unable to give a very accurate statement of the number hatched; but, guessing from previous hatchings of trout, I should say that there are at least twelve thousand young fry in the boxes.

I have, &c.,

ALFRED GREENFIELD.

Sir Julius Vogel, K.C.M.G., Wellington.

Hon. Secretary.

No. 26.

The SECRETARY, North Canterbury Acclimatization Society, to the SECRETARY, Marine Department.

SIR,— Canterbury Acclimatization Society, Christchurch, 7th May, 1886.

I am sorry I have been prevented replying to yours of the 1st ultimo long since; but my time has been so fully occupied I really could not do it. I can now report fully on the four boxes allotted to our hatchery. Each box contained about 22,200 eggs—total, about 88,800; of which 1,000 were handed over to Mr. Johnson, of Opawa. In the box that was outside the cool chamber we found 21,934 dead eggs, and from the other three boxes we took out 24,446; making a total of 46,380 which had lost all vitality—if they had ever possessed any, for many were unimpregnated. This large mortality is not at all surprising when the large quantity of fungus, as well as many patches of byssus, that was found among them is taken into consideration. We succeeded, however, in hatching out 41,420, of which 1,420 have since died, and about 4,000 (which I have had picked out, and put into a large tray by themselves) are deformed (crooked backs) and will die; leaving in our boxes at the present date about 36,000 fry. They are very small, but appear healthy and quite fit for removal. In fact, the sooner this is effected the better, as the risk will be less. I do not mean they are fit to turn out—certainly not; but removal to nursery connected with the streams into which they are eventually to be liberated. Please let this be understood.

Talking over the matter of distribution of these fry with our Council the other day, it was suggested that, as our streams have had some of last season's fry recently put in them, it would be well to divide this lot with the other societies which have applied for them—that is, if they are to be separated into small lots; which we think—and always have advanced that opinion—that success will never be achieved until we deal out large numbers into the individual streams. If you will inquire of Sir Julius Vogel how he would like them divided and distributed, I shall be willing to see that the numbers allotted are delivered at our hatchery to any accredited agent for the several societies and others; or I will undertake to deliver them at the appointed places if Sir Julius wishes. The temperature of the water running through our hatching-boxes has averaged 52·50° through the season, varying only 2·50°.

I am daily expecting the returns from each hatchery where the ova was delivered; on receipt of which I will make up the totals and forward a complete official report.

The ova taken out in boxes from the refrigerating cool chamber were frozen to death—result not at all astonishing to me, as I experienced the same termination to some I experimented upon in the “Kaikoura.”

I have, &c.,

S. C. FARR,

Hon. Secretary and Treasurer.

The Secretary, Marine Department, Wellington.

No. 27.

The CHAIRMAN, Otago Acclimatization Society, to the Hon. the COMMISSIONER of TRADE and CUSTOMS.

SIR,— Otago Acclimatization Society, Dunedin, 17th May, 1886.

In compliance with your request, I have the honour to forward herewith report by Mr. Deans, the curator of our society, giving all particulars as to treatment of salmon ova per “Ionic,” recently received from you by the hands of Mr. Farr. The result, giving twelve thousand healthy fish out of about twenty thousand ova received, is most satisfactory, being a great improvement upon all previous shipments, and shows that the arrangements effected by the Government at Home for obtaining and packing the ova were excellent. I think it will be found that Mr. Deans's report gives particulars on all points of any importance in connection with the hatching of the fish. We have now on hand, in all, fifteen thousand six hundred healthy young salmon, a number which will enable us to introduce the fish with a much greater chance of success than heretofore. Our society has now made arrangements for the reception of about half a million ova, and our accommodation can be increased almost indefinitely as occasion requires, so that, in the event of the Government receiving further shipments of salmon ova, which the society earnestly hopes may be arranged for, we shall be in a position to take charge of an almost unlimited number.

I have, &c.,

J. P. MAITLAND, Chairman.

The Hon. Sir Julius Vogel, Wellington.

Enclosure in No. 27.

REPORT of the Hatching of the Salmon Ova ex steamship “Ionic,” at the Otago Acclimatization Society's Ponds, Opoho.

7th May, 1886,

SIR,—

I have much pleasure in furnishing you with the particulars respecting the hatching of the Otago society's portion of the salmon ova per steamship “Ionic.” You will be pleased to hear that the result of this shipment, so far as our lot is concerned, has been most satisfactory, far exceeding my own expectations, hatching out better than any lot of ova I have yet seen imported. On the 23rd March I received from Mr. Farr a case of salmon ova (numbered 89), together with a good supply of ice, which I at once conveyed to the Opoho ponds, and next morning early I commenced the unpacking, the temperature of the water in the hatching-boxes being 30·54°. I reduced it to 46°. But, before putting the ova in this, I first placed them in a basin of water, the temperature of which I previously reduced to 36°; by this means the ova were more gradually brought to the natural temperature of the water in the boxes. When I got them all unpacked, and

the good ova all safely placed in the boxes, I counted the bad ones and found there were 6,080. Attached to this you will find a record of the daily temperature of the water, also of the number of bad eggs removed from the boxes daily, the latter amounting to 1,316, which, with 260 deformed ones added to 6,080, makes a total of 7,656 to the bad. And as I have not yet counted the young and healthy alevins, I estimate there will be about 12,000 lively young salmon, about five weeks old. But I will let you know the exact number as soon as possible. The first young fish came wriggling out of the shell on the 28th March, but it was the 3rd and 4th April before the hatching was general, and some lingered in the egg until the 25th April. You will see by this that the hatching extended over a period of twenty-eight days. And I am glad to say very few of this lot died in the hatching, as is usually the case in Home shipments. From the time the ova were placed in the boxes the temperature of the water gradually lowered until the 15th April, when the thermometer showed 46°. It rose again to 56° on the 25th, but again went down to 49°. With reference to the packing, &c., I may say that the case for convenience and economy I think was all that could be desired, and of the same description as the cases in which the Otago society have for several years past received shipments of ova from Sir James Maitland. The packing also was of the same neat and careful manner, and evidently had been performed by a person of experience, the moss being clean and carefully selected, and of the usual kind. I may also add there were no cloths used in packing this ova. This is, so far as the preservation of the ova is concerned, quite immaterial. I believe the ova will live amongst the moss longer without it, although it may facilitate the unpacking after a short duration.

I have, &c.,

J. P. Maitland, Esq.,

F. DEANS, Curator.

President of the Otago Acclimatization Society.

HATCHING of Salmon Ova per steamer "Ionic," at the Otago Society's Ponds. (The temperatures were usually registered between the hours of 2 and 6 p.m.)

Date.			Bad Eggs removed.	Temperature of Water.	Date.			Bad Eggs removed.	Temperature of Water.
			No.	Deg.				No.	Deg.
March	25	...	306	54	April	16	...	...	46
"	26	...	133	52	"	17	...	12	48
"	27	...	114	52	"	18	...	...	50.3
"	28	...	84	51	"	19	...	32	53
"	29	...	56	50	"	20	...	...	50.3
"	30	...	65	49	"	21	...	36	50.3
"	31	...	...	50	"	22	...	...	51
April	1	...	...	51	"	23	...	38	53
"	2	...	86	51.3	"	24	...	...	54.3
"	3	...	39	52	"	25	...	14	56
"	4	...	26	55	"	26	...	38	52
"	5	...	38	55	"	27	...	...	51
"	6	...	30	51	"	28	...	...	49
"	7	...	18	48.3	"	29	...	...	50.3
"	8	...	19	47	"	30	...	...	50
"	9	...	...	47	May	1	...	33	50.3
"	10	...	33	48.3	"	2	...	...	50.3
"	11	...	...	47	"	3	...	...	50
"	12	...	23	46	"	4	...	20	51
"	13	...	...	47	"	5	...	...	51
"	14	...	10	47	"	6	...	...	50
"	15	...	13	46	"	7	...	...	49

No. 28.

The Hon. the COMMISSIONER of TRADE and CUSTOMS to the AGENT-GENERAL.

SIR,—

Government Buildings, Wellington, 8th April, 1886.

Referring to previous correspondence in connection with the shipment of salmon ova sent by the "Ionic," I have the honour to inform you that that vessel arrived at Wellington on the night of the 21st ultimo, and that the next day the ova were distributed among the various Acclimatization Societies.

The eight boxes of salmon ova in the chamber were in very good condition; but the ova in the separate box were all dead, being covered with byssus; and I regret to say the ova in the freezing-chamber were all dead. I am informed that the fertilization of the ova appears to have been unusually good, and that the packing was very well done. My attention has, however, been called to what appears to be a fault in all British-packed ova—that is, the thick, heavy coating of moss between the layers of ova. It has been suggested that the ova would carry more easily and with less loss if a small quantity of moss was carefully "teased out" in a thin light layer. The thick coating sets tightly on the top of the ova, and byssus often appears—generally where the drip from the ice seems to have been the greatest. I only throw out the suggestion for consideration, without supporting it.

The trout ova contained in one of the cases brought out in the refrigerator appear to have been well packed. The sawdust round the inside box was dry. Within, the moss was frozen into a solid mass, the trays being all stuck together, and the ova showed no sign of life. The appearance presented was like layers of light-yellow, transparent, unfertilized ova, each egg being surrounded with a coating of hoar-frost, and one side having slightly fallen in. Several experiments—such as thawing very slowly in iced water, thawing in the air, &c.—were tried; but no signs of vitality could be detected. The ova turned opaque at once on being placed in water, but the indentation on the side swelled out, and each egg resumed its proper shape. There were only about a dozen ova that did not turn opaque. I have not yet received any report as to the condition of the other case of trout ova and the small box of salmon ova, except that they were all dead.

The attendant, Frank Paxton, appears to have done his work well under the direction of Professor Posnett, and he was paid the gratuity of £5 promised to him. I note that the attendant was not supplied with any thermometer; so no record was kept of the temperature in the chamber.

In conclusion, I have to express, both to Sir James Maitland and yourself, the thanks of the New Zealand Government for the great care and interest that you both have taken in attending to this valuable shipment. I feel that it would have been impossible for the ova to have arrived in so good a condition if it had not been for the enthusiastic care that you both have taken of the shipment.

I telegraphed to you on the 5th inst., informing you that the shipment of the ova had been successful, and authorizing you to procure a piece of plate of the value of £50 for presentation to Sir James Maitland; and, in accordance with your suggestion, I have this day written to that gentleman thanking him for the pains he has taken.

I have, &c.,

JULIUS VOGEL.

The Agent-General for New Zealand, 7, Westminster Chambers, London, S.W.

No. 29.

The Hon. the COMMISSIONER of TRADE and CUSTOMS to Sir J. R. G. MAITLAND.

SIR,—

Government Buildings, Wellington, 8th April, 1886.

Sir Francis Dillon Bell, the Agent-General for this colony in London, having drawn my attention to the great pains and interest that you have taken throughout in connection with the introduction of salmon into New Zealand, and more especially in connection with the shipment of salmon ova sent to this colony by the steamer "Ionic," I have to express to you, on behalf of the Government, their warmest thanks for your great kindness and consideration. They feel that it is due largely to your enthusiastic care that the shipment has arrived in such good order.

Sir Francis Dillon Bell has been requested to present you with a piece of plate on behalf of the Government, in slight testimony of their appreciation of your kindness. They hope that you will do them the honour to accept it.

I have, &c.,

JULIUS VOGEL.

Sir James Ramsay Gibson Maitland, Bart., Howietoun, Stirling, Scotland.

No. 30.

The AGENT-GENERAL to the Hon. the COLONIAL TREASURER.

SIR,—

7, Westminster Chambers, London, S.W., 4th March, 1886.

I have referred in more than one letter to the experiment of freezing ova in the refrigerator at the docks, as a test of the chance of success in sending out salmon ova in the freezing chambers of the steamers. You will remember that I was very doubtful of the ova living in so low a temperature, and that I did not think it right to take the risk of sending in that way the large shipment which went by the "Ionic." When we first opened the box of ova, after about forty days in the docks' refrigerator, a number of them seemed to be alive; but when they came to be examined at Howietoun Fishery, the embryo had really been destroyed: and Sir James Maitland was thereupon quite satisfied that if the salmon ova by the "Ionic" had been sent in the ship's refrigerator they would all have perished. It is true that the test was not absolutely conclusive, because the death of the embryo might have been due to the stage chosen for the experiment, or perhaps to the extreme temperature to which it had been subjected; but it appeared to be due to rupture from distortion during the freezing; though it did not necessarily follow that an embryo on the point of hatching, when the tissues were firmer, would have died.

After consultation with Professor Ewart, Sir James could not advise further experiments of the same kind at present; and I am inclined to think you will have to give up the idea of sending out ova in any ship's refrigerator. But we shall wait to hear the result of the box of trout ova in the "Ionic," in order to compare results; and in the meantime we are consulting whether—if the work is to be renewed next season—a chamber could not be designed where the temperature should not be allowed to fall below 25° Fahr., and where the eggs should be placed within about a fortnight of hatching, at which stage it is just possible they might keep for a long time without injury.

I have, &c.,

The Hon. the Colonial Treasurer, Wellington.

F. D. BELL.

No. 31.

The AGENT-GENERAL to the Hon. the COMMISSIONER of TRADE and CUSTOMS.

(Telegram.)

London, 9th March, 1886.

HERRING ova: Considerable shipment "Ruapehu." Professor Ewart strongly wishes send scientific assistant therewith. Instruct whether shall. Please reply immediately.

No. 32.

The Hon. the COMMISSIONER of TRADE and CUSTOMS to the AGENT-GENERAL.

(Telegram.)

Wellington, 10th March, 1886.

HERRING ova: If expense reasonable, and you approve, send assistant.

No. 33.

The AGENT-GENERAL to the Hon. the COLONIAL TREASURER.

SIR,—

7, Westminster Chambers, London, S.W., 12th March, 1886.

You will be glad to hear that the "Ruapehu" takes out some millions of herring ova which Professor Cossar Ewart has succeeded in getting for you on the west coast of Scotland.

It is impossible for me to describe at length to-day all that Professor Ewart has done, or the immense pains he has taken, ending in his going himself in Her Majesty's ship "Jackal" to take the ova for you. Indeed, I could not attempt to give you an account of the innumerable details that have had to be provided for in order to let the experiment have a good chance of success; and I must confine myself for the present to saying that the greatest care has been taken at every point through a long and anxious time.

When Professor Ewart consented to take charge of the work, I do not think even he had any idea of the number of things to be thought of for so novel an experiment. It has been altogether a most difficult and delicate work. The initial difficulty alone—of providing a current of cold sea-water over the eggs during the whole voyage—was so formidable that I almost gave up of overcoming it; but fortunately it happened that to the unrivalled knowledge and experience of the Professor himself we were able to add the mechanical skill and ingenuity of Mr. Johnson, who has for so many years helped in the acclimatization of salmon in Tasmania and New Zealand. I sent him up to Edinburgh to consult with the Professor about the appliances to be invented, and after repeated trials they decided upon a plan which may be roughly described in a few words by saying that the ova had to be placed in a number of glass jars and wooden boxes, which had to be set up in chambers adjoining the ship's refrigerator, with tanks and pipes carefully devised for passing a constant stream of sea-water over the eggs at a temperature of about 33°. This required a very elaborate design, but I can only send you to-day a brief explanation of it by Mr. Johnson, with tracings to show how the appliances work.

Professor Ewart has desired me to request you to have made as quickly as possible a wooden box, or "car," of rough planks, about 12ft. square by 6ft. deep, such as is used for keeping live fish in harbours here. I annex an extract from his letter on the subject, with a rough diagram of what is wanted; and I presume there will be no difficulty in putting the planks together in a few hours after the ship's arrival. The cheese-cloth required for it is on board, in the captain's charge. The jars and boxes are to be placed in this "car" for removal to the place you have chosen for the ova to be deposited in; and Professor Ewart suggests that you should ask Professor Parker, at Dunedin, to assist, as everything depends on it if the ova get out safely.

It would have been useless to send out the ova at all without some one in charge who understood what to do during the voyage and immediately after arrival. Professor Ewart wished very much that a scientific man should accompany the ova, to watch over them during the voyage and for some time after arrival, to examine the various creeks and bays where future consignments of eggs should be deposited, and to study the surface fauna and the temperatures of the water around part of the coast; and he proposed for this purpose to send Dr. Lamont, one of his assistants in the Fishery Board of Scotland, a distinguished graduate who has for some time been engaged in fishery work at the Professor's laboratory. I did not hesitate to telegraph for your sanction to this proposal; and we were much gratified by the promptness with which you were pleased to give it. But we decided, after all, to take further time for considering so large a step, and to content ourselves for the present with sending one of the Professor's laboratory assistants, Mr. Jamieson, for whom a second-cabin passage has been accordingly taken in the "Ruapehu."

The ova, after being put ashore from H.M.S. "Jackal" at Stranraer yesterday, came up by the night train, and arrived safely at Plymouth only an hour ago; and I must put off further details until next mail.

I may be allowed to hope that the care with which this experiment is being made will insure its success. Here it is considered to be one of very great interest and importance; and I take the opportunity of giving you one or two particulars from a report on the progress of fish-culture in America by Professor Ewart, in order to show what the introduction of the herring may be to us, and what, if the present experiment succeeds, you will have done for New Zealand by directing me to make the attempt. In the course of his investigations into the subject of increasing fish-supply by artificial means, he had to speak of the American shad, which belongs to the herring family—differing, however, from the Scotch herring in being larger, and in resorting for part of the year to fresh water, where (like the salmon) it deposits its spawn. Rivers on the Atlantic coast which once teemed with shad had been so completely denuded that when artificial culture was first started it was for some time impossible to obtain fish enough to do any work at all; yet now the artificial introduction of millions of fry each year has not only resulted in shad being more abundant than ever along the Atlantic coast, but in one of the most interesting experiments ever made with fish—viz., the taking of the shad right across the American continent into the waters of the Pacific at the Sacramento River. "From this small beginning," says Professor Ewart, "mighty results have followed; for the shad have already extended their range two thousand miles along the Pacific coast, making themselves at home in the Pacific Ocean and the rivers entering it from the American continent." It may be your good fortune, from an equally small beginning, to see shoals of the Scotch herring one day around our coasts; and it is in the hope of

bringing about such an incalculable good to New Zealand that Professor Ewart has devoted so much time and pains to the present experiment. I trust that, whether the ova reach you safely or not, you will be pleased to express in some form to the Professor the acknowledgments of the Government for all he has done.

The Hon. the Colonial Treasurer, Wellington.

I have, &c.,
F. D. BELL.

Enclosures in No. 33.

Mr. T. JOHNSON to the AGENT-GENERAL.

SIR,—

Gun Lane Sawmills, Limehouse, London, E., 11th March, 1886.

I have the honour to forward you the enclosed report on the transport of herring ova. The report and the tracings attached will show you the completeness of the arrangements made to insure the probable success of so delicate and important an undertaking.

Trusting my efforts may meet with the approval of your Government,

Sir F. D. Bell.

I have, &c.,
THOMAS JOHNSON.

REPORT ON THE TRANSPORT OF HERRING OVA.

HAVING, at the request of Sir F. D. Bell, Agent-General to the Government of New Zealand, been directed to give the subject of transport of herring ova to New Zealand my consideration, and to devise the best possible means to do so successfully, I have to report, after several conferences with Sir F. D. Bell, who read to me extracts of the correspondence he had had with Professor Cossar Ewart, of the Edinburgh University, on the subject of the transport of the herring, I prepared a draft plan, together with certain queries, so as to get some data on which I could act correctly, which in due course were forwarded to Edinburgh. Correspondence on the matter ensued; but, owing to the difficult nature of so important an undertaking, and as much valuable time would be lost by further correspondence, it was deemed advisable for me to proceed to Edinburgh and have a personal conference with Professor Cossar Ewart. I reached Edinburgh on the morning of the 19th February, 1886. In conference with Professor Ewart I found that the undertaking was more difficult and delicate than was at first anticipated. The difficulties to be overcome were: first, that there must be a constant supply of pure sea-water equal to 120 gallons per hour; second, that a low temperature of the sea-water was absolutely necessary, without which the success of the enterprise would be an absolute impossibility. After my conference with Professor Ewart, I telegraphed to Sir F. D. Bell, and returned to London. On the 20th February I gave Sir F. D. Bell a verbal report, and arranged with him to take steps to formulate and complete my plans for the undertaking. After consulting the Superintendent-Engineer of the New Zealand Shipping Company, and viewing one of the company's steamers (the "Ruapehu"), I arranged certain details towards completing my plans. The difficulties I had to encounter were: first, how to obtain a constant supply of 120 gallons of pure sea-water per hour; second, how to dispose of the water after passing through the boxes and jars containing the ova; third, how to reduce the flowing sea-water of 120 gallons per hour to a temperature of 33° or 34° Fahr. The first difficulty was overcome by connecting a steam donkey-engine pump with the sea-water supply of the refrigerating engine; second, by a second steam donkey-engine pump, so as either to pump the waste water over the side or back to the supply-pipes leading to the ova boxes and jars; third, to reduce the temperature of the sea-water to 33° or 34° Fahr., leaden pipes are arranged in the main trunks of the provision-chamber in such a way as to insure the desired low temperature.

After completing the plans necessary to attain probable success, I submitted them to Sir F. D. Bell and to Professor Ewart for their approval, which being given, the work was at once begun on board the steamer "Ruapehu."

Having successfully completed the general arrangements on board the above steamer, which sailed from London this day, 11th March, I have to refer you to the enclosed tracings from the drawings, showing (alphabetically arranged) the details of the whole plan as carried out for the transport of the herring ova to New Zealand.

THOMAS JOHNSON.

EXTRACT from Letter from Professor COSSAR EWART.

SIR,—

13, Rothesay Place, 2nd March, 1886.

Have you heard from New Zealand as to the reception of the eggs or young fish? If nothing has been settled, perhaps you might write by first mail instructing the authorities there to construct a large wooden box, such as is used for keeping living fish in harbours. This box might be about 12ft. square and 4ft. or 5ft. deep, with the planks of the bottom and sides about 2in. apart, so as to admit a through current of water. The spaces between the planks should be covered over by cheese-cloth such as is enclosed. If a car such as this is constructed the boxes used for carrying the eggs from Girvan should have the glass plates reintroduced to them, and be then placed in the car. The glass jars should have their corks removed and their ends broken, so as to admit a through current.

Sir Francis Bell.

I have, &c.,
J. C. EWART.

No. 34.

The AGENT-GENERAL to the Hon. the COMMISSIONER of TRADE and CUSTOMS.

(Telegram.)

London, 19th March, 1886.

HERRING ova: Greatest regret telegram Madeira reporting failure.

No. 35.

The AGENT-GENERAL to the Hon. the COLONIAL TREASURER.

SIR,—

7 Westminster Chambers, London, S.W., 22nd March, 1886.

Hardly had I sent you my telegram of the 18th instant, informing you that a large number of herring ova had been shipped in the "Ruapehu," when a telegram arrived from Madeira stating that the experiment had failed, and that Mr. Jamieson (to whom I referred in my last letter, of the 12th instant, No. 326) had decided to leave the ship and return to this country. I was obliged, therefore, to send you another message on the 19th instant reporting the failure.

I am not yet able to give you any information as to the cause of this disastrous result; but as soon as Mr. Jamieson returns to Professor Ewart full particulars will be sent to you. In the meanwhile, however, the unfortunate failure that has occurred makes it necessary to decide an important point. You will have seen from the tracings which I sent you in my letter of the 12th instant, No. 326, what elaborate appliances had been devised by Professor Cossar Ewart and Mr. Johnson for sending out the ova; and the question immediately arises—of what is to be done with the chamber itself and the rest of these appliances when the "Ruapehu" arrives in New Zealand. I consulted Mr. Johnson on the subject; and now enclose copy of his report, recommending that no part of the fittings excepting the leaden pipes and the steam-connections of the donkey-engine pumps should be removed or interfered with in the colony, but that they should be allowed to come back in the same ship. This, however, is a matter of expense which I am powerless to decide here, and I am obliged therefore to ask you to be pleased to arrange with the New Zealand Shipping Company on the spot whether the chamber and appliances shall be dismantled or whether they shall come back for any repetition of the experiment next season. Mr. Johnson suggests that the chamber could be utilized as a butter-room or for some other purpose, in order to lessen the cost of the space taken up by it; and perhaps the New Zealand Shipping Company may be able to devise some plan of the kind which would recommend itself to you as justifying the expense of paying for the space on the homeward voyage.

I have, &c.,

F. D. BELL.

The Hon. the Colonial Treasurer, Wellington.

Enclosure in No. 35.

Mr. T. JOHNSON to the AGENT-GENERAL.

SIR,—

Gun Lane Sawmills, Limehouse, E., 23rd March, 1886.

Having carefully considered the question what should be done with the fittings erected by our firm on board the steamer "Ruapehu" for the transport of herring ova, and consulted Mr. Thompson, Superintending Engineer of the New Zealand Shipping Company, I have come to the conclusion, considering the expense that has been incurred, to recommend that no part of the fittings except the zigzag leaden pipes which are placed in the main cold-air delivery trunk, and the steam-connection of the donkey-engine pumps, should be removed or interfered with. The removal of the above pipes will prevent obstruction in the delivery of the cold air during the homeward voyage of the vessel; and disconnecting the steam-pipes of the donkey-engine pumps will avoid any possible interference with the main engines. If desirable, I would suggest that the chamber containing the apparatus should be used as a butter-room, or for such other purpose as may lessen the cost of the space so taken up.

I have, &c.,

THOMAS JOHNSON.

The Agent-General for New Zealand.

No. 36.

The Hon. the COMMISSIONER of TRADE and CUSTOMS to Professor EWART.

SIR,—

Government Buildings, Wellington, 22nd May, 1886.

I have much pleasure in conveying to you, on behalf of the Government of New Zealand, their thanks for the great assistance you gave in connection with the late shipment of herring ova. Should it be decided to renew the experiment at any future time, I hope you will be able to again give the aid which Sir F. Dillon Bell writes me he found invaluable.

I have, &c.,

JULIUS VOGEL.

Professor Cossar Ewart, 13, Rothsay Place, Edinburgh.

No. 37.

The Hon. the COMMISSIONER of TRADE and CUSTOMS to the AGENT-GENERAL.

SIR,—

Government Buildings, Wellington, 22nd May, 1886.

I have the honour to acknowledge the receipt of your letters of the 4th, 12th, and 22nd March last on the subject of herring ova, and the transportation of ova to New Zealand.

Salmon Ova.—I have read with much interest your proposal with reference to sending our salmon ova in a chamber in which the temperature should not be allowed to fall below 25° Faht.

You will have before this received my letter of the 8th ultimo, in which I informed you that the trout ova that came out in the freezing chambers were all dead; even the few that did not turn opaque I have since ascertained did not hatch out. So that it appears clear that there is no possibility of bringing out ova in a ship's freezing chamber. Your proposal will receive due consideration, and I will communicate with you again on the subject.

Herring Ova.—I regret very much the failure of the attempt to bring out herring ova to New Zealand. I am very sensible of the great exertions made by both Professor Ewart and yourself, and feel sure that the failure did not arise from any cause which you could possibly foresee. Owing to the delay of the March San Francisco mail your letter of the 22nd of that month was not received until after the herring-ova fittings were removed from the "Ruapehu." The company kept them undisturbed until the last moment, hoping that the mail would arrive; but, as the ship had to commence freezing, they had to take them down a few days before the receipt of your letter. I think that it is doubtful whether it will be expedient to repeat the herring-ova experiment again at present; but I should propose continuing with salmon ova. However, I should be glad to have your valuable opinion on the matter.

I enclose a copy of a letter that I have addressed to Professor Cossar Ewart, thanking him for his exertions in the matter No. 28; and I should feel much obliged if you would convey the thanks of the Government to Mr. Thomas Johnson for his exertion in the matter.

The Agent-General for New Zealand,
7, Westminster Chambers, London, S.W.

I have, &c.,
JULIUS VOGEL.

No. 38.

The AGENT-GENERAL to the Hon. the COLONIAL TREASURER.

SIR,—

7, Westminster Chambers, London, S.W., 9th April, 1886.

I received with great pleasure your telegram of the 5th instant, telling me that the shipment of ova by the steamer "Ionic" had succeeded, and directing me to present a piece of plate to Sir James Maitland, with the thanks of the Government; and I sent you a message, in reply, requesting you to accept my respectful acknowledgments for the reference you had been pleased to make to myself in your telegram. The failure of the eggs placed in the ship's refrigerator makes it fortunate that a separate ice-chamber was used for the salmon ova.

I was a witness before a Committee of the House of Lords, a day or two ago, upon a Bill to bring water into Falkirk, the effect of which would have been to destroy Howietoun fishery. It happened that I had just received your telegram of the safe arrival of the ova, and could mention it in aid of Sir James Maitland's opposition to the Bill. Ten minutes afterwards the Bill was thrown out.

Professor Cossar Ewart was summoned to London a few days ago on official business, and we had a long conference over the causes of failure of the herring experiment. We came clearly to the conclusion that the mischief ought never to have occurred, and could certainly be prevented in any fresh experiment; but we waited to hear what Mr. Jamieson had to say, who has since returned from Madeira. I have now received a letter from Dr. Ewart saying that he will presently send me a full report, when I will address you again. In the meantime I shall send you a telegram in time to reach you before the arrival of the "Ruapehu," asking you to send back the appliances in the "Ruapehu," as Dr. Ewart has no doubt of the next experiment succeeding.

The Hon. the Colonial Treasurer, Wellington.

I have, &c.,
F. D. BELL.

No. 39.

The Hon. the COMMISSIONER of TRADE and CUSTOMS to the AGENT-GENERAL.

SIR,—

Wellington, 2nd June, 1886.

I have the honour to acknowledge receipt of your letter of the 9th April last on the subject of salmon and herring ova.

I was glad to hear that my telegram had reached you in time to have been of service to Sir James Maitland. I may here mention that I have received a report, copy of which is enclosed, from Mr. J. P. Maitland, President of the Otago Acclimatization Society, in which he states that the salmon ova received by the "Ionic" arrived in better condition than any before sent out. As I have already informed you in my letter of the 22nd ultimo, I am not sure that it will be expedient to repeat the herring-ova experiment; but I will await the receipt of Professor Ewart's report before finally deciding. I trust, however, to be able to repeat last year's successful importation of salmon ova next season.

The Agent-General for New Zealand, London.

I have, &c.,
JULIUS VOGEL.

No. 40.

EXTRACT from the "SCOTSMAN" of the 17th March, 1886.

SIR,—

17th March, 1886.

I observe Professor Ewart has despatched ova from Girvan. Had I been aware he contemplated such a thing I would have told him there was great danger in sending it out in such a manner, as I had tried it some years since. The only way to make certain is to freeze the ova into a solid body and to keep it so for several weeks. Twenty-five years ago a friend of mine was sceptical that the refuse herring ova found in the bottom of a boat was alive. One morning, he and I being at Newhaven, and seeing a quantity lying in the bottom of the boat, I said, "We will try the experiment." So I got a small quantity in my handkerchief, and he took it home and placed it in a basin, and filled it with sea-water, changing it for fifteen days, when, to his astonishment, he saw a multitude of young herring. He then put them into the sea at the Chain Pier. We tried a

quantity more, but we got a cocoanut, emptied it out, then filled it full of ova, and froze the same into a solid, kept them buried in ice for a month, placed the shell into a basin of sea-water, and within eighteen days a large number came to life. Now, I think this could be done for two months. If so, it would be a better plan than the Professor's; but we will see how his succeeds.

I have, &c.,

JOHN ANDERSON.*

* J. Anderson is the largest fishmonger in Edinburgh.

No. 41.

EXTRACT from the "SCOTSMAN" of the 13th March, 1886.

HERRINGS FOR NEW ZEALAND WATERS.

An important experiment is being made to introduce the herring into New Zealand waters, the result of which will be watched with the greatest interest. . . . The attempt to introduce the herring into the seas around New Zealand has been taken up by the New Zealand Government, whose representative in this country, Sir F. Dillon Bell, invited Professor Cossar Ewart (Professor of Natural History in the Edinburgh University) last December to take the matter in hand. Since then Professor Ewart has been engaged in devising the appliances necessary for conveying the ova in safety so great a distance. In ordinary circumstances the ova of the herring hatch in about sixteen days, and the problem he had to face was to retard development for about forty days, so that the fry should not appear until the ship was near its destination. In the loose yolk-bag with which the fry come into the world there is sustenance for the creature for about a week before it commences feeding in the ordinary way. The chief point to be kept in view in connection with the construction of the apparatus was to preserve through the entire voyage a steady quiet flow of pure sea-water over the eggs at an equable temperature of 33° Fahr. This Professor Ewart believes he has succeeded in doing, and the apparatus so designed will be placed on board a mail steamer at Plymouth when on its voyage from London to Otago.

Professor Cossar Ewart was at Ballantrae, on the Ayrshire coast, this week, and secured a large stock (several millions) of well-matured ova for the purpose of the experiment. The gunboat "Jackal" was placed at his disposal by the Fishery Board, and he had the assistance of a number of experienced fishermen in catching the herrings. The ova were placed in large carboys and in wooden boxes with glass slides, which were fixed in stoutly-made barrels filled up with sea-water, and in this way conveyed to Plymouth. They were under the care of one of Professor Ewart's assistants, who will see the ova duly placed in the apparatus on board the "Ruapehu," and regulate the temperature, &c., on the way across the seas.

Ballantrae banks are the spawning-grounds of the Lochfyne herrings, which yearly migrate there in February and March to spawn. Arrangements were accordingly, as has been said, made with the commander of H.M.S. "Jackal," J. W. Osborne, R.N., Superintendent of the Fisheries, and now stationed on the coast, who entered most cordially and zealously on the interesting work, and with Mr. Wilson, officer of the Board of Fisheries of the district, who accompanied Professor Ewart to the banks and rendered useful assistance. Every arrangement being completed, H.M.S. "Jackal," with Professor Ewart and assistants on board, on Thursday morning, at 6 a.m., steamed out of Lochryan for the banks. . . . Flocks of gannets being seen on the surface of the water, and hovering in the air on the north edge of the bank, the "Jackal" was headed in that direction, where several seine-trawlers and trammel-boats were working. The active and well-disciplined crew of the "Jackal" speedily had a couple of boats under oar and in charge of Mr. Mortimer, who had had quite an experience in this kind of work, and were not long in returning from a couple of seine-trawlers who were working the net at some distance (the "Jackal" delaying a near approach lest the herring should be disturbed) with at first but a small supply of live herrings in two carboys. These were examined, the males placed in one cask filled with salt-water, and the females in another. As had been already ascertained in former observations, most males are found in the seine-net; and in the trammel-net, which fishes at the bottom, most females. Repeated runs were made amongst the boats, and very soon a sufficient supply was obtained of vigorous ripe herrings in strong healthy condition for spawning, some evidently of two years' growth, and others larger and full grown. The process of spawning was now proceeded with, and expertly and successfully conducted by Professor Ewart and Mr. Brook. The glass jars and plates for receiving the spawn for carriage to the colony were carefully prepared, a small quantity of sea-water being placed in each jar. The manipulation of the herrings then took place. First the female or roe herring was taken in hand, and gently pressing it the spawn flowed in thin strings, the jars being turned so that the sides all round might be fairly and evenly coated. The male or melt herring was treated in a similar manner; the melt dissolving, gave the water a whitish milky appearance, the eggs of the herrings fixing themselves firmly on the sides of the glass jars. The glass plates were each placed in a tub, covered with water, and coated with ova in the same way, the ova becoming fertilized in about fifteen minutes. The water was then removed, the herring scales carefully picked off the insides of the jars, fresh water put in, and the jars placed in barrels filled with sea-water, each glass jar having a pipe for securing a constant flow of water, and a discharge pipe or syphon for taking the water off. In the initiatory process the jars were set in tubs of ice to keep the temperature low and delay the hatching, as the known difficulty will be to keep the eggs from hatching until about the time when they will arrive in New Zealand. Twenty-four plates and four jars were successfully coated with spawn, and all under the most favourable conditions. The "Jackal" steamed back to Lochryan in the afternoon. The jars containing the ova were packed in ice in a special van, and despatched to Plymouth in charge of an assistant, who conveyed them on board the ship last night, and is now accompanying them to their final destination.

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