

(No. 37.)



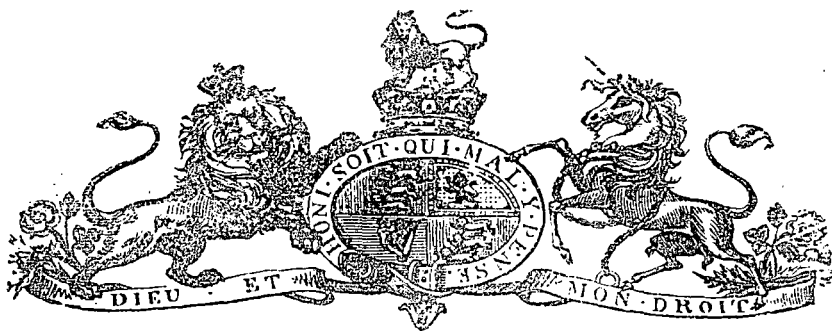
1886.

PARLIAMENT OF TASMANIA.

**SUPERINTENDENT AND INSPECTOR OF
FISHERIES :**

REPORT FOR 1885.

Presented to both Houses of Parliament by His Excellency's Command.



FISHERIES DEPARTMENT.

REPORT for the Year terminating June 30th, 1886.

SIR,

I HAVE the honor to present you with my Report indicating the operations connected with the Fishing Industries of this Colony that have been conducted through the medium of my Department during the past twelve months. I also avail myself of this opportunity of laying before you various suggestions and recommendations with relation to their further improvement and development.

A.—MARINE SECTION.

1. *The Oyster Fisheries.*

It affords me much gratification to inform you that considerable success has attended the experiments made in the direction of breeding oysters on the Government reserves and in private fisheries, upon the system advocated and explained in my last year's report. This system consisted chiefly of laying "collectors," constructed of thin planks or split palings coated with cement, over the breeding oysters placed upon the beds. At the Government reserve at Little Oyster Cove, on a private bed at Great Oyster Cove, and on one at the Prosser's River on the East Coast, a considerable quantity of brood or spat has adhered to the collectors laid down, giving the greatest encouragement for a yet more substantial and commercially remunerative return resulting from the following out of the system upon a sufficiently extensive scale. The operations so far conducted have been furthermore productive of much valuable information concerning the breeding habits of the oysters of this Colony that may be hereafter utilised in their artificial culture. Thus, last summer none of the collectors were placed on the beds until November, which is generally accepted, as is May in England, as representing the earliest month in which the spat or brood is liberated. From the size of the brood deposited on the collectors, as also by an examination from time to time of the parent oysters, it was, however, made evident that the greater portion of the spat had been already emitted before the collectors were placed over them. This circumstance indicates the desirability, in future years, of having at least a considerable portion of the collectors in position by the commencement of September. It is of interest to observe that the larger portion of the spat deposited, at both the Government reserve at Little Oyster Cove and on the private bed in the adjacent bay, was derived from the New Zealand oysters, thus demonstrating that that variety is suitable for acclimatization in Tasmanian waters. Another important circumstance to be recorded of the Oyster Cove reserve is the fact that the spat thus obtained was attached exclusively to the cemented collectors, and in no case to the shells of the parent oysters or to the rocks, cultch, or other natural objects to which they customarily adhere; this fact of itself affords practical evidence of the efficacy of these collectors for the purpose for which they have been devised. An illustration of a piece of cement with young oysters attached, taken from one of the collectors at Little Oyster Cove, will be found at Fig. 3 of the plate facing page 6.

At the Government reserve at Spring Bay the collectors ordered were not supplied sufficiently early to intercept the fall of spat. At the same time the fall which took place, both in the reserve and also upon the public and private oyster beds throughout the Spring Bay district, has been a very abundant one, the young brood adhering plentifully to the parent shells, mussels, cultch, stakes, and any other objects that afforded them a suitable fulcrum for attachment. With a continuance of this past season's rate of increase, and provided a sufficient amount of breeding stock is maintained on the reserves and private beds, it should not take many years for this locality to regain its original prominent position with relation to the oyster trade. At the present time the recovery of this

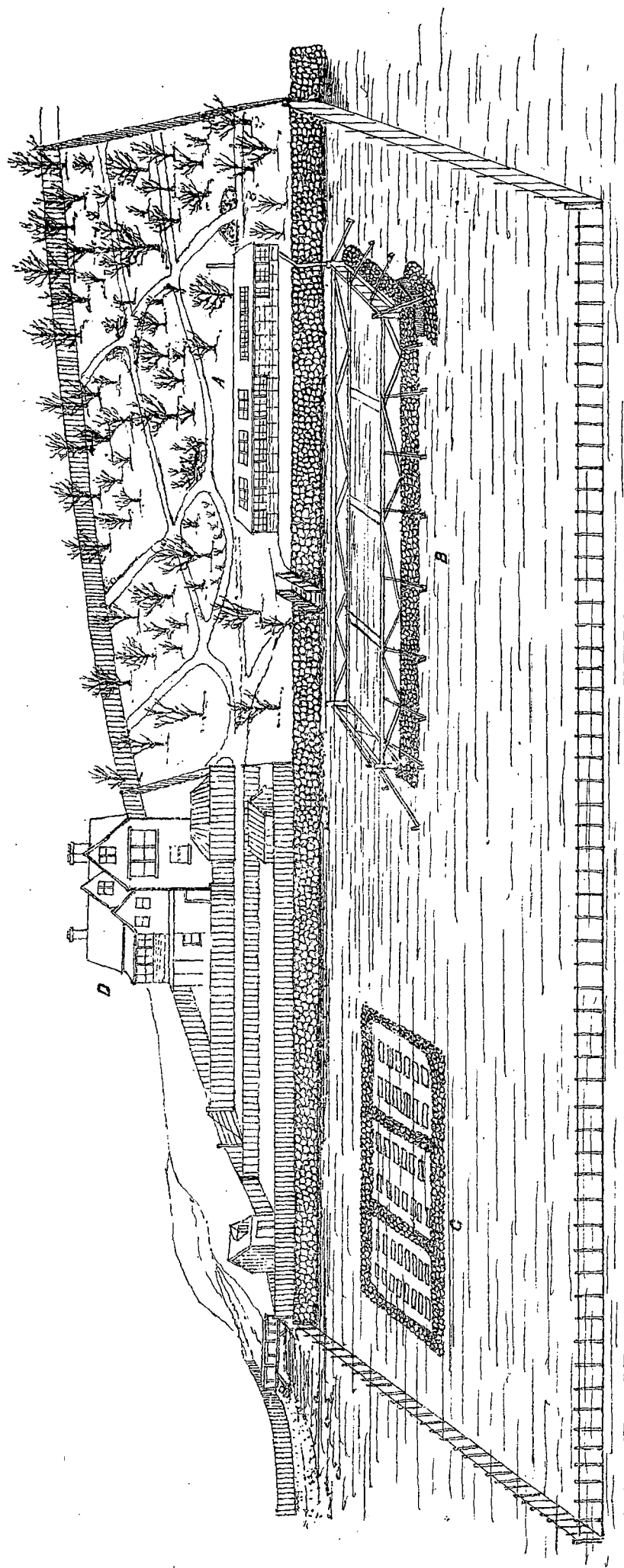
district has advanced to such an extent that there has been no difficulty experienced in obtaining from it during the present season a stock of about 50,000 breeding oysters for laying down upon various private beds and the Government reserves. From the third Government reserve, established at the West Arm on the Tamar estuary, no substantial results have as yet been obtained, it having been found impossible to complete it and stock it with oysters in time to obtain last summer's fall of spat. A fourth oyster reserve is in process of formation at Little Swanport; and it is proposed, with the funds available for the purpose during the current year, to establish similar Government reserves in the following neighbourhoods, *i.e.*, the Carlton River, Taranna, and Southport in the Southern district; and at George's Bay, Port Sorell, and other favourable localities to be yet selected, on the North-east and Northern coast lines.

I am gratified to be able to report to you that there are already substantial prospects of accomplishing one of the most important objects of the establishment of the Government oyster reserves. At the time of their inauguration it was anticipated and intended that these reserves, in addition to fulfilling the part of nurseries for the propagation of oysters and the replenishment of the surrounding waters, should likewise constitute central stations for the assistance and encouragement of private enterprise in a similar direction, and by whose aid, if developed upon an extensive scale, the restoration of the oyster fisheries of this Colony on a thoroughly substantial commercial basis would be greatly accelerated. One private bed with breeding oysters is already established in the vicinity of the Government reserve at Little Oyster Cove, one at Spring Bay, and another at the Prosser's River. Encouraged by the success of these undertakings, applications have been or are about to be made for the leasing of three more suitable areas for the same purpose at Spring Bay, for the same number at Great and Little Oyster Cove, and for others in the neighbourhood of Little Swanport, and at Port Sorell on the north coast.

The important operations connected with oyster culture in course of progress at the newly inaugurated Fisheries Establishment at Battery Point are recorded under the following heading.

2. Fisheries Establishment, Battery Point.

Since the date of my last Report, and in accordance with the recommendations therein made, suitable premises, including a residence, have been selected and are now rented by the Government at Battery Point for the development and maintenance of a Fishery Establishment. To this site the marine hatchery originally erected at Gore-street has been transported, and re-erected with various additions. The premises occupied include a sea frontage of about three hundred feet, allowing the location of the hatchery so close to the water's edge that the salt water necessary for the maintenance of a constant circulation through the tanks is pumped direct from the sea. The mechanical arrangements are at the same time so disposed that in the event of a storm or flood rendering the outside water temporarily unfit for circulation, the intake pipe can be disconnected, and the water circulated independently from a small reservoir beneath the building. The great advantages derived from the transport of the marine hatchery to its present site, next to the means now afforded for obtaining an unlimited supply of pure sea water, are the facilities it has provided for constructing in connection therewith tidal ponds for the culture of oysters and marine fish generally upon the adjacent shore. For this purpose an area of about one acre has been enclosed with stakes wired together after the manner adopted for the fencing off of the Government oyster reserves, and within this enclosure two such ponds have been already constructed. In consequence of the circumstance that at ordinary ebb tide the water recedes from a large portion, and at spring tides from almost the entire extent of this enclosed area, the plan has been adopted of excavating these ponds for a foot or two below lowest tide level, so that under any circumstances they contain an abundant supply of water. The nature of the ground upon the foreshore enclosed has proved to be well adapted for the construction of these ponds, as immediately beneath a thin superficial covering of sand it is composed of pebbles and tenacious clay so firmly amalgamated as to almost resemble concrete; any excavations made in this bed are consequently thoroughly watertight. In the preparation of this site for the required purpose it was found desirable to divert the course of that portion of the Sandy Bay Rivulet which formerly at low tide flowed over the area now occupied by the ponds. This has been accomplished by further excavating the main channel of the stream straight out to sea, and away from the area enclosed, and by interposing between the two a barrier or groin of rocks and tree trunks, which has had the desired effect of accumulating along its course a natural sand-bank which effectually shuts off the water of the creek. One of the ponds constructed in the enclosure, measuring sixty feet long by thirty wide, is situated immediately beneath the hatchery, and serves as a reservoir for the constant supply of the tanks. This pond, being fenced round with wire netting, is further utilised for the storage and culture of a variety of edible fish in addition to oysters. With each ebb and flow of the tide the water in this pond is more or less completely renewed, and the fish under these conditions are found to thrive remarkably. A general view of the Fisheries Establishment at Battery Point, showing the relative positions of the hatchery and tidal ponds as above described, is given in the accompanying illustration. A list of the edible species of fish that have been cultivated in the pond and tanks since the establishment of the Fishery at Battery Point is herewith annexed. Details of the observations concerning the spawning, habits, and other data of practical importance that have been made concerning a greater or less number of these fish, will be found further on.



A. Aquarium and Hatchery B. Enclosed Fish and Oyster Pond C. Open Oyster Pond. D. Residence.

— PLAN OF FISHERIES ESTABLISHMENT —

— BATTERY POINT — (*Hobart*)

LIST of edible indigenous Fish cultivated at the Fisheries Establishment, Battery Point, between the months of February and July, 1886.

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|---|--|
| 1. Native Salmon (<i>Arripis salar.</i>) | 7. Rock Gurnet (<i>Sebastes percoides.</i>) |
| 2. Sea Carp (<i>Chilodactylus Allporti.</i>) | 8. Flathead <i>Platycephalus bassensis.</i>) |
| 3. Black and Silver Perch (<i>Chilodactylus macropterus.</i>) | 9. Tasmanian Whiting (<i>Sillago ciliata.</i>) |
| 4. Magpie Perch (<i>Chilodactylus gibbosus.</i>) | 10. Snotgall Trevally (<i>Neptonemus brama.</i>) |
| 5. Real Trumpeter (<i>Latris hecateia.</i>) | 11. Sea Mullet (<i>Agonostoma Forsteri.</i>) |
| 6. Silver Bastard Trumpeter (<i>Latris Forsteri.</i>) | 12. Rock Cod (<i>Pseudophycis barbatus.</i>) |
| | 13. Tasmanian Ling (<i>Genypterus blacodes.</i>) |
| | 14. Flounder (<i>Rhombsolea monopus.</i>) |

In both the ponds and tanks of the Fisheries Establishment the chief attention is at present being given to the culture of oysters. There is already upon the premises a stock of some eight or ten thousand oysters of different varieties, and in all stages of growth, and which stock it is proposed to yet further increase in anticipation of the approaching spatting season. The varieties include the irregular-shaped Rock Oyster (*Ostrea angulata*) from New South Wales; the smooth variety of *O. edulis* from New Zealand, and many modifications of the indigenous type of the same species. The majority of these oysters have now been acclimatised in the tanks and ponds for the last three or four months, and in which space of time it is gratifying to have to record that all of them have thriven and considerably increased the size of their shells. This is particularly noticeable of the New South Wales species, and which it is anticipated from this experience it will be found possible to establish and propagate in these waters. The experiment now in course of trial as to whether they will be able to withstand the severity of the Tasmanian winter months, will be an important factor in this question. The series under cultivation includes, in addition to the stock of adult oysters for breeding purposes, samples of brood raised last summer at Little Oyster Cove and other Government reserves. Among the useful functions accomplished by the Oyster Culture Department of the Fisheries Establishment at Battery Point may be mentioned the rôle it fulfils of an accessible model for the advantage of those who, in increasing numbers, are taking up oyster culture as a private enterprise, and who can there obtain information and instructions as to the best methods upon which to conduct their operations. It is also of much value as a central station, at which practical experiments can be made with the view of solving the many vexed problems that present themselves to the pioneers of this industry, and of discovering newer and more profitable methods of cultivating and breeding this mollusc. Already among eminent American and European oyster culturists it is maintained that the secret of obtaining a far larger per-centage of the brood produced by the parent oyster than has hitherto been accomplished is to be solved through the medium of tidal ponds and tanks, wherein the oysters will be supplied with all the requirements necessary for their healthy growth and development, and wherein at the same time suitable provision is made for the retention of the produced spat. Tentative experiments having this object in view are now in course of progress under scientific direction in all of the more important oyster-growing communities, and it is hopefully anticipated that some material assistance towards the solution of this important question may be forthcoming from this newly established practical branch of the Fisheries Department of this Colony.

Among the more important points to which my attention has been recently directed and advice solicited is the widely recognised desirability of discovering some method for cultivating oysters in localities in all respects suitable for their growth, with the exception that the labour involved in keeping them constantly clear from sedimentary deposits, or from sinking beneath a too yielding bottom, is too costly for their profitable culture. Experiments made with the view of surmounting this difficulty have resulted in the invention of a species of frame or cradle composed of wood and strong galvanised wire netting, measuring 6 feet long and 3 feet wide, upon which the oysters are placed, and raised to a height of from 9 to 10 inches off the ground. This description of frame so completely answers the purpose for which it was devised that they are being supplied to all of the Government reserves, and are recommended for the use of private growers. Each frame of the dimensions above quoted, which are found to be most portable, conveniently carries as many as 500 adult oysters, so that for a well-stocked bed of, say, 10,000 oysters, a score of them will be sufficient. Having the stock placed on frames of this description, a vast amount of labour usually bestowed in keeping the beds clean and the oysters free from sediment can be dispensed with. In place of the tedious process of dredging the bed through and raising the oysters a few at a time, to be cleaned and re-deposited on the cleared ground, each frame, with its contents, can be raised to the surface, a few shakes suffice to get rid of the sediment that may have accumulated upon them, and they may again be lowered to their place. This object may indeed be accomplished in many instances without raising the frames to the surface, it being sufficient merely to tilt the frame to and fro a few times, as it lies on the bottom, with the aid of a boat-hook, such agitations effectually getting rid of all the sedimentary matter. Wire handles for raising the frames to the surface of the water, with the aid of a boat-hook, should be attached in the manner shown in the accompanying illustration.* Further advantages are attached to this frame system of oyster culture, since not only

* In the illustration, Fig. 1, one frame is shown raised to the surface of the water by blocks and cord attached to a tripod; where the boat is sufficiently large to carry a mast, the same apparatus may be more conveniently worked from a small derrick affixed to the mast.

can the frames and their contents be raised to the surface at all times to be cleaned and manipulated, but it affords facilities, hitherto unprovided, of keeping an accurate estimate of the amount of stock placed upon the beds, and of watching, from time to time, the progress it is making in development. The form of spat collector that can be most advantageously utilised in conjunction with these oyster frames is the one figured and described in my last Report under the title of the "single pale" collector, consisting, as its name implies, of a single split paling 4 feet long by 8 or 9 inches wide, having its under surface coated with cement and a brick attached at either end to retain it in the desired position. The experience gained by the past season has demonstrated this to be the most economic and productive form of collector, no alteration in its construction being suggested, with the exception that, by placing a single wire loop or handle in the centre instead of one at each end, as hitherto, their portability, both in and out of the water, is greatly increased. The adaptability of these paling collectors for use in conjunction with the newly-invented frames is illustrated at Fig. 2 of the accompanying plate, their size being such as to allow of their being placed over the oysters in either a single or in two or more transverse rows. It is anticipated that the oysters placed upon the frames will of themselves constitute very efficient spat collectors, their under surfaces, exposed through the meshes of the wire netting, being kept free from slime and sediment, and raised to a height above the ground favourable for the adherence of the spat. Empty shells or cultch similarly placed on frames in the vicinity of the breeding stock are also likely to prove favourable fulchra for the brood to adhere to. A remaining direction in which the oyster culture department of the Fisheries Establishment at Battery Point is found to be of great assistance in the operations now in course of progress, relates to its value as a central depôt for the reception and temporary storing of the stock brought from a distance for distribution among other reserves.

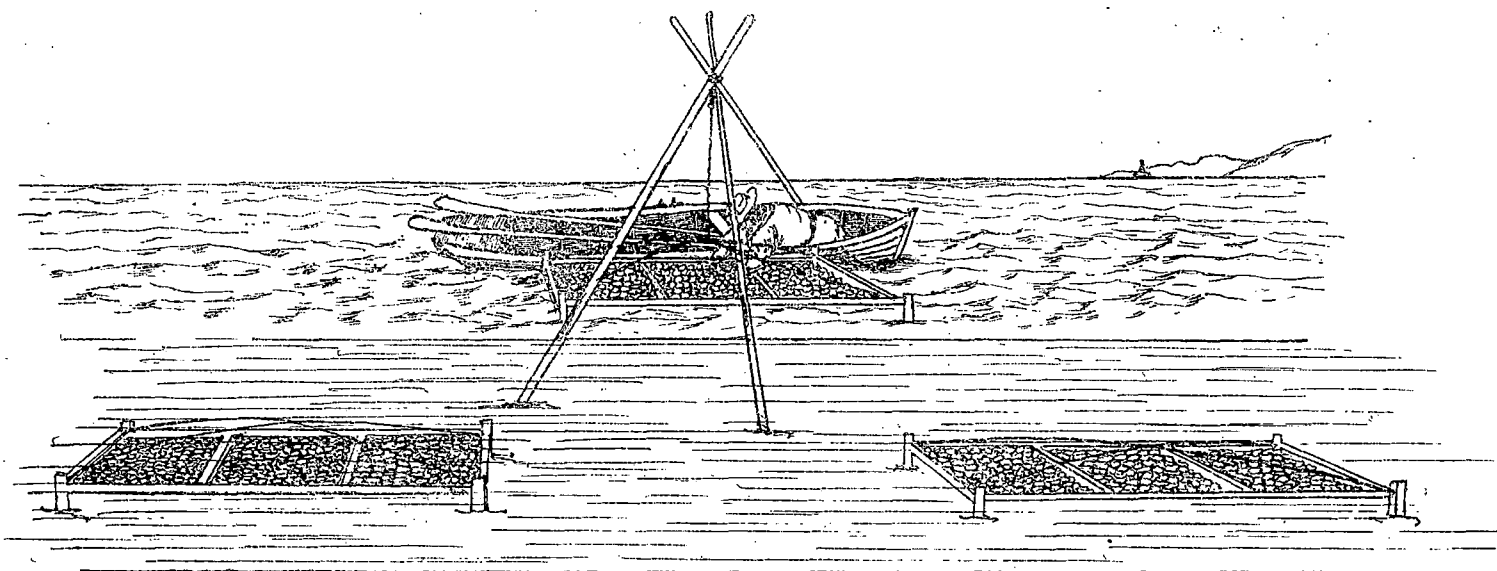
An important purpose for which the tanks and ponds at the Fisheries Establishment were originally designed, and for which they will now be immediately utilized, is for the reception and culture of the various European Marine Fish and Crustacea it has been determined to attempt to acclimatize in Tasmanian waters. Negotiations with this object in view have already been successfully conducted with the representatives of those Societies and Companies in England who are in a position to render the most material assistance. These include the shipping firm of the Shaw, Savill, & Albion Co., whose magnificent line of steamers now make Hobart a port of call *en route* for New Zealand, and who have undertaken to provide all the accommodation and attendance required upon the voyage. The National Fish Culture Association, London, and the Brighton Aquarium Company, have kindly consented to collect together in their tanks suitable specimens for transport, and, so to say, educate them for the artificial life to which they will be exposed during the passage out. The Tasmanian Fish Market being particularly poorly supplied with edible crustacea, the single species known as the Crayfish, or more correctly Crawfish (*Palinurus Edwardsi*) being the only type that commands an extensive sale; it is proposed as a first experiment to attempt the transport and acclimatization of the delicate flavoured European Lobster (*Homarus vulgaris*), and the large edible crab (*Cancer pagurus*.) The seaweed-clad rocky bays and inlets of the Tasmanian coast are eminently suited for the growth of these crustacea, and wherein, if once established, they could not fail ere long to so multiply as to form new and profitable fisheries.

For the guidance of those who will be practically associated with the conduct of the proposed experiments, a brief pamphlet of instructions and suggestions has been already drawn up and remitted to England. The more essential features of these instructions and suggestions may be summarised as follows:—

The accommodation on shipboard required for the Lobsters will be a series of three or four slate tanks, measuring 6 feet long, 2 feet wide, and 2 feet deep, and constructed in accordance with the plans remitted. These tanks should be fixed to the floor anywhere on deck and under cover, where a constant flow of sea water, as supplied to the baths, with an independent tap to each tank, can be depended on. The only modification required in their formation, as compared with an ordinary four-sided cistern, is the addition to each end of three or four small slate partitions dividing the bottom into narrow compartments like the stalls of a stable, and in which it will be found that the Lobsters will separately take up their abode and be protected from injury during the rolling of the vessel in heavy weather. A waste-pipe, preferably of vulcanite, which can be screwed in and out of a socket at the bottom of the tank, should maintain the water under ordinary circumstances at a height of 12 inches, and being unscrewed, permit of the entire emptying and flushing out of the tank. The tanks provided must be well scoured out before the lobsters or any other fish are placed in them, special care being taken to remove all traces of the red lead or other cement used in making the joints of the tanks watertight.

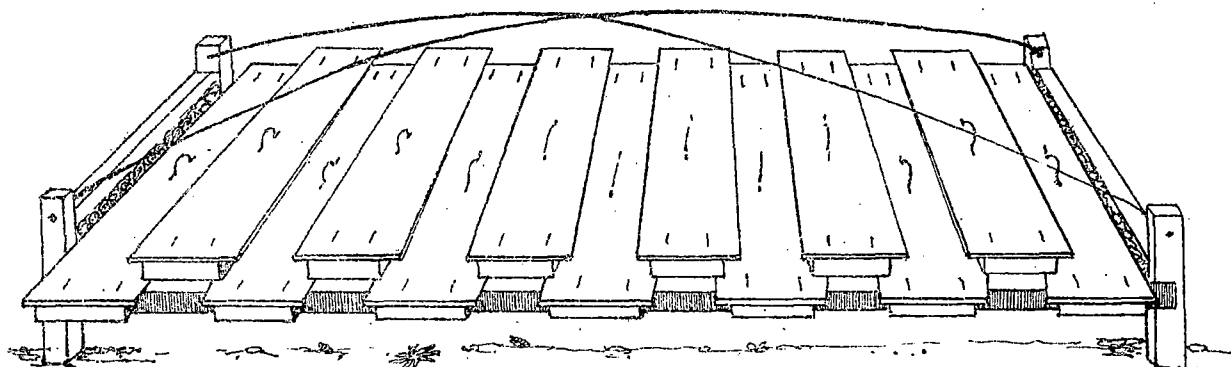
Six Lobsters only, of the average length of ten or twelve inches, should be placed in each of the tanks of the size and shape described. If smaller, measuring eight or nine inches only, eight specimens might be accommodated, while if they are remarkably large, say from twelve to eighteen inches long, four only should be located in each tank. The water supplied to the tanks should be laid on from the pipes that feed the baths, or from an independent pipe through which it may be constantly renewed from the sea. A stream of water from this source, about half an inch in diameter, should, if possible, be continuously discharged into each tank through a separate tap. If not maintained constantly flowing, it should be with as short intervals of cessation as possible.

The food the Lobsters will require will be raw fish, such as cod, whiting, herring, or any other description obtainable in the market, and which must be stored for them in the refrigerator. Three or four pieces about an inch and a half long, or, say, the size of half a finger, should be placed in each tank over night,



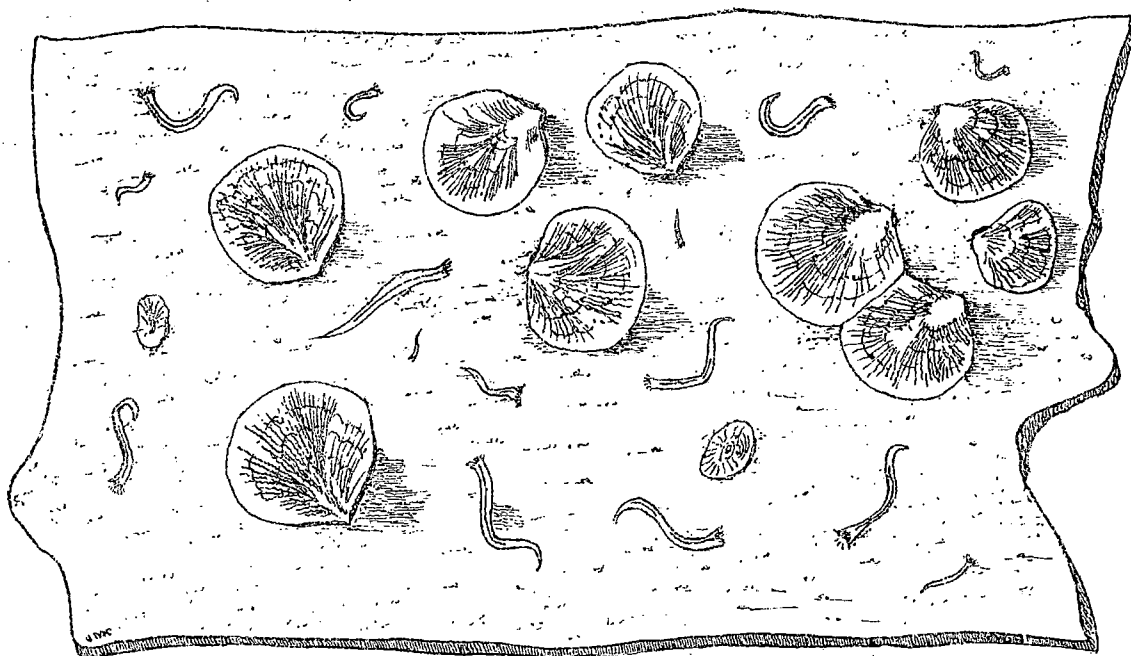
See page 5

Fig. 1. Ideal figure representing two Oyster frames in position at the bottom of the water, and a third one raised to the surface for examination



See page 6

Fig. 2. Oyster frame with two tiers of Collectors for the attachment of the brood or spat



See page 3.

Fig 3. Fragment of Cement with Oyster brood, four months old attached, taken from a Collector at Little Oyster Cove.

two or three nights each week (lobsters being night-feeders), and removed again in the morning with a small hand-net or a pair of forceps. Occasionally, if it appears desirable, the waste-pipe should be unscrewed, the water let off, and the tank quickly flushed and cleaned from all remnants of food or dirt that may have accumulated. This may be done without handling or disturbing the lobsters, which should at all times, unless absolutely necessary, be carefully avoided. The morsels of food given should be rinsed free from all loose particles or discolouring fluids that might foul the water before being placed in the tank. If the food is completely devoured it may be supplied at more frequent intervals, but on no account must a large quantity be allowed to remain in the tanks for any length of time. Lobsters not being particular as to the freshness of their diet, and indeed preferring it rather stale, the same pieces of food when left may be washed, laid aside, and served up at the next meal. Bread, biscuit, butcher's meat, or other matters that are not the natural food of the lobster, must on no account be thrown into their tanks. Having corners to themselves, and sufficient food, the lobsters will probably agree during the voyage. If, however, they show a tendency to fight and mutilate one another, it will be desirable to tie their claws with tape.

The Lobsters most particularly desired for importation are what are known as "berried hens;"—that is, female fish bearing berry or spawn,—but which must not be too fully matured, lest it should hatch out on the voyage. The number of eggs or spawn carried by a single female lobster ranges on the average from 20,000 to 30,000, so that the progeny of a relatively small number of spawn-bearing female fish, if successfully reared, as proposed, in the tanks of the hatchery until old enough to provide for their own security, and as was experimentally accomplished by me in the year 1877 in association with the Manchester Aquarium, would be sufficient to establish the species in Tasmanian waters. In consequence of the sea water at Gravesend not being sufficiently pure for the well-being of the fish, it has been suggested that the Lobsters, if put on board at that port, should be kept in flat baskets, packed with damp sea-weed (as supplied at Billingsgate market or the wholesale fish shops), till well out to sea, and the supply cistern for the bath and tanks has been thoroughly flushed out and filled with pure sea water. This precaution is exceedingly important, since its neglect would scarcely fail to result in the loss of the entire cargo before fairly out of port. In the event of the heat when passing through the tropics being so great that the Lobsters show signs of exhaustion, the temperature of the water may be reduced by standing a pail, or, better still, a stone jar with ice, from the refrigerator, in the tanks, and which ice should be renewed from time to time. The ice must not be placed in the sea water, as it would injuriously affect its density. A more than ordinarily brisk circulation through the tanks should be maintained at these times, while the cooler temperature of the surrounding atmosphere may be obtained by stretching a piece of sail-cloth, to be kept continually saturated with water, over the roof of the deck-house.

The large edible Crab of the English coast (*Cancer pagurus*) would be a great acquisition to the Tasmanian fish supply, and might be imported and acclimatised under the same conditions suggested with regard to the Lobster. Young specimens, measuring three or four inches only across the back, would be most suitable for transportation, and supplies of these are already promised through the medium of the Brighton Aquarium Company. So large a number as thirty or forty such small-sized crabs might be safely carried in each of the tanks described. The tanks containing them should be flushed out every morning, and the crabs left in the tank without water for an hour or so, they being accustomed to be so left on the shore when the tide goes out. Food similar to that prescribed for the Lobster will be required for the Crabs, the only difference to be noted being that they prefer it very fresh.

In addition to Lobsters and Crabs, it is proposed hereafter to import and acclimatise in Tasmania such other valuable food fishes as the English Sole, Brill, and Turbot. These fish might be transported in the same tanks and under much the same conditions as those required for the Lobsters and Crabs. The stock of fish experimented with should consist of examples that have already been acclimatised in an aquarium and educated to hand-feeding. A number of Tasmanian Flounders (*Rhombsolea monopus*) have in this manner been trained at the Fisheries Establishment, Hobart, to feed on raw fish, mussels, or ordinary earth-worms. The fish selected for transport in the manner suggested should not exceed six or eight inches in length. Of these dimensions as many as a dozen might be included in each tank, or a greater number of a smaller size. The bottom of the tanks in which the fish are placed should be covered to a depth of about two inches with a layer of clean sharp sand, and they must not be completely emptied out for cleaning, as in the case of Lobsters and Crabs. The cleaning process, when necessary, may be best effected by turning on a fuller stream of water, accompanied by its gentle agitation. Refuse food or other matter of a solid nature may be removed with a small muslin net. The embarkation of the stock selected would be most favourably effected from the port of Plymouth, or, if practicable, from a boat meeting the steamer off Brighton. The fish, on arrival at Hobart, will be immediately transferred to the tanks and ponds connected with the Government Fisheries Establishment at that seaport, specially constructed for their reception and now in complete working order.

The plans for the construction of the tanks, and all other information necessary for the successful carrying out of this acclimatisation project, together with the requisite authority and funds, having been vested with the recently appointed Agent-General for the Colony in England, a notification of the shipment of the first cargo is expected daily.

Other species of valuable food fishes that it is proposed hereafter to import and acclimatize in Tasmanian waters, and by so doing to lay the foundation of new and profitable fishing industries, are the common Herring (*Clupea harengus*), and the true Cod (*Gadus morrhua*) of the European seas. The conditions under which the importation of these fish will have to be attempted differ essentially from those pertaining to the types already referred to. The herring, more especially, is so easily injured, and is so impatient of captivity, that it would be useless to attempt its importation in either its young or adult states, and in both instances it is proposed to deal with the ova or spawn only. Considerable difficulties, however, attend the realization of this project, and it will be requisite

in the first instance to carry out some tentative experiments in England with the view of testing whether it is possible to maintain the ova of these marine fish in a state of vitality for the period of forty days or more that would be occupied in their transport to the Antipodes. An attempt has been made during the current year by the Government of New Zealand to import herring ova to that Colony from the coast of Scotland, all the details of their collection and shipment being entrusted to the able management of Professor Cossar Ewart, of Edinburgh. The ova collected, numbering several millions, were collected and placed on board the *Ruapehu*, which left England for New Zealand on the 14th of March. This first experiment, whilst doubtless productive of experiences that will prove of great value in the conduct of future operations, was not successful in the accomplishment of its main object, none of the ova in fact being alive by the time the vessel reached Madeira. Details of the circumstances attending the failure of this first experiment have not yet come to hand, but from the published account of the means adopted for the transport of the ova, I anticipate that it was found impossible to maintain the low temperature required for them under the conditions provided. The chief features of Professor Ewart's scheme were as follows:—The ova, adhering to the sides of glass jars or carboys, or to glass slides enclosed in boxes fixed in barrels of sea water, were deposited in the ice chamber of the ship, and a constant circulation of sea water maintained through the receptacles containing them by means of a pump and donkey engine. With the object of reducing to and maintaining the inflowing sea water at an equal temperature of 33 degrees Fahr., at which point it was anticipated the further development of the ova would be arrested, and the vitality or capacity for future development at the same time remain unimpaired, it was conducted to the receptacles containing the ova through coils of lead pipes embedded in ice. If anything like a brisk circulation of the sea water, pumped direct from the sea, was maintained on the voyage it may be anticipated that this sea water had not time to part with its twenty or thirty or more degrees of excess temperature before it arrived at the ova, and which in consequence either perished or prematurely developed. The uniform maintenance of a current of sea water at the low temperature required could have been more certainly assured by connecting the pumping apparatus with a cistern or reservoir immersed within an ice chamber, the same water being circulated over and over again among the ova throughout the voyage, as in the tanks of an ordinary aquarium. The cistern should in such a case be constructed of slate, and the pumps and connecting pipes be composed of hardened gutta percha or vulcanite,—lead, zinc, or other metals decomposing in sea water and imparting to it poisonous properties. Even under these last-named conditions many difficulties would be presented, and I anticipate that the successful transport of marine fish ova to the Antipodes, if capable of accomplishment, will be achieved under much less complex conditions. In communications upon this subject to authorities in England, I have already suggested the possibility of preserving such ova alive for the period required, by simply storing them in an ice-house in jars of the purest sea water, or in air-tight receptacles without any water, but with just sufficient moisture to keep the ova from drying up. In the last named instance, if not adhesive, they might be spread upon linen or flannel-bottomed trays, in imitation of the plan hitherto practised in the packing and transport of the ova of many fresh-water fish, including the Tasmanian Grayling. As soon as it is practically demonstrated that the ova experimented on will survive an incarceration of forty days in the vaults of an ice-house, under either of the foregoing conditions, the problem of transporting them to the Antipodes will be virtually solved, as it will be then necessary only to provide for the construction of an ice-house on board the vessels selected, and to store them therein under conditions identical with those already so successfully applied to the transport to this Colony of the ova of various species of Salmonidæ. In view, in fact, of its being found desirable to import further consignments of the ova of the English Salmon (*Salmo salar*), or to similarly experiment with other valuable fresh-water species, such as the Landlocked Salmon (*Salmo sebago*) or the White Fish (*Coregonus albus*) of America, it might be advantageously arranged for a cargo of the ova of the various marine and fresh-water species to be packed in an ice-house on board the same vessel. The ova of the marine fish, such as Cod and Herring, are relatively of so much smaller size that millions of them may be packed in the space required for thousands only of the Salmonidæ. In the event of it not being found possible to organise a simultaneous shipment of marine and fresh-water fish ova it might be arranged, at a considerable saving of cost to either Colony, for the products of a whole cargo of marine fish ova to be divided between Tasmania and New Zealand, Hobart being used as a port of call by the chief shipping firms running steamers between England and the last named Colony. So soon as the State-supported Marine Biological Laboratory now in course of erection at Plymouth is completed, it is anticipated that much material aid will be derived from that institution in the direction of the transmission of cargoes of ova and living fish for acclimatisation in this and the neighbouring colonies.

A list of the species of indigenous marine fish of commercial value that have been cultivated up to the present time in the ponds and tanks at Battery Point, pending the arrival of the European species, has been already given at page 5. In association with all of the more important edible marine fish of this Colony, I have recently entered upon the task of collecting together accurate statistics concerning their average size and weight, the seasons in which they are most esteemed for food, the methods by which they are captured, their habitats, natural food, and more especially, the time of the year in which they spawn or are found with mature roe and milt. The accumulation of this information concerning all of the edible Tasmanian species,

and more particularly of that relating to their seasons and habits of spawning, will necessarily be a work of time. The data so far collected are embodied in the accompanying Schedule, (p. 10). Certain of the information contained in this Schedule has been collated from the evidence given before the Royal Commission on the Fisheries of this Colony held in the year 1883, and published in their Report. Blank forms corresponding with this Schedule have likewise been distributed among the more intelligent fishermen, who have filled them up, so far as their experiences would permit, concerning the special varieties they catch for the market. Important information concerning other varieties have been derived from a personal observation of the specimens cultivated in the tanks, and which observations may be hereafter turned to account in the direction of their artificial propagation. It has thus in the case of both the rock cod (*Pseudophycis barbatus*), and the Tasmanian flounder (*Rhombsolea monopus*), been ascertained that the ova, for the first few days at least of its existence, floats upon the surface of the water, and that with respect to the last-named fish there are at least two broods in the course of the year. As a matter of fact, flounder fry, varying from half an inch to an inch in length, have been observed by me on the neighbouring shore more or less abundantly during the whole of the six months, January to June, 1886, that the fishery has been established at Battery Point, and in like manner female fish, distended with mature spawn, have been obtained and placed in the tanks of the aquarium during a corresponding period. Somewhat similar observations have likewise been made at the fishery concerning the common Mullet (*Agonostoma Forsteri*), the Colonial Salmon (*Arripis salar*), and the Rock Cod (*Pseudophycis barbatus*.) These facts assist to reconcile what previously appeared to be contradictory evidence given before the above-named Fisheries Commission, wherein different witnesses have in certain instances respectively cited spring, summer, and autumn months as the spawning season of the same fish. It is a remarkable circumstance in connection with the Native Flounder, that while females with matured spawn are abundant, no male fish with ripe milt, out of a series of several hundreds personally examined, could be obtained for the purpose of artificially fertilizing their ova. A similar apparent scarcity of male fish is also reported to me by fishermen whom I have commissioned to look out for, and save me any examples with ripe milt. In explanation of this seeming anomaly, it has occurred to me as being possible that the male individual of this species are of so much smaller size than the females as to fall short of the standard length of nine inches, at which they may be legally taken, and are thus excluded from the market. My next Report will, it is anticipated, place on record the solution of this question. As an illustration of the practical bearing of the data being collected concerning the spawning habits of our food fishes, it may be indicated that, in the case of the Flounder more especially, the evidence already elicited demonstrates the impracticability of establishing, as has been suggested in some quarters, a close time for this fish during spawning operations.

As soon as the spawning season for the Real Trumpeter (*Latris hecateia*) arrives, it is intended to conduct operations at the hatchery in the direction of artificially fertilizing the ova and liberating the developed fry of this fish in large quantities in the nearer bays and reaches of D'Entrecasteaux Channel, with the view of bringing the fishery for this much esteemed species nearer home, and within reach of the fishermen during those tempestuous seasons when, under present conditions, they are unable to obtain them. By carrying out such a system of artificial culture, with reference to the celebrated cod fishery of the North American Coast, this most valuable commercial industry has been established several degrees south of the natural habitat of the species, and in waters of a higher temperature than it might have been supposed the fish would have thrived. The experience derived from the artificial culture of this and other species of marine fish would seem to indicate that they possess a very strong "homing" instinct, wandering to no great distance from the locality in which the fry are liberated, or should they do so, revisiting it again periodically. Concerning the spawning habits of the Real Trumpeter,—as to whether the ova is large or small, adheres to submerged objects, or floats upon the surface of the water,—no accurate knowledge has so far been obtained. There is also much diversity of opinion as to the precise season when the spawn is matured. Fish with milt and roe are reported to be taken between the months of May and August, but there is strong reason for believing that it is not shed until the months of August or September. The Tasmanian Real Trumpeter deservedly enjoys so high a reputation as a table fish, and is of such intrinsic worth—its average market value one shilling per pound, being identical with that of the English Salmon or Turbot—that it would be well worth while to attempt to acclimatise it in English waters. Examples of young or half-matured fish from the hatchery and ponds at the Fisheries Establishment might be shipped back to England in the tanks used for the importation of the European Crabs, Lobsters, and other species; or if the experiments with the ova should prove successful, they could be transported in this form in the ice-house of the vessel bringing out the English varieties. The species in question accommodates itself so readily to confinement in the small tanks of an aquarium, taking food from the hand within a few days of its capture, that it would seem to be peculiarly suited for transportation to remote distances.

Successfully conveyed to England, no fitter localities for its acclimatization could be found than the coasts of Devonshire, Cornwall, and the Channel Islands, whose rocky shores are clad with luxuriant growths of *Laminaria* and other of the larger *Fuci* which most nearly resemble the huge Bull Kelp (*Pyrocystis*) of its native seas, and among which it delights to dwell.

SCHEDULE of Tasmanian Marine Market Fish.

| <i>Name.</i> | <i>Adult Size or Weight.</i> | <i>In Season.</i> | <i>Mode of Capture.</i> | <i>Natural Food.</i> | <i>Habitat or where caught.</i> | <i>When spawns or found with Roe.</i> | <i>Remarks.</i> |
|---|------------------------------|---|--|----------------------------------|---|---------------------------------------|---|
| 1. Red Perch (<i>Anthias rasor.</i>) | 1 to 2 lbs. | All the year | Graball; hook and line | Shellfish; Brit* | Among kelp | June and July | Not common. * "Brit" is the popular name given by the local fishermen to a floating gregarious species of crustacea closely allied to or identical with <i>Grimmothea gregarea</i> . |
| 2. Native Salmon (<i>Arripis salar.</i>) | 1 to 7 or 20 lbs. | All the year | Graball; seine; hook & line or jig | Small fish; Brit | Open water | February | Gregarious, the young having spots and bars, is known locally as Native Salmon Trout (<i>Arripis truttaceus</i> , Cuv. & Val.) |
| 3. Black Bream (<i>Girella tricuspidata.</i>) | 1 to 3 lbs. | Oct. to March | Graball | Seaweed ? | Shoal water | — | This and the following type are considered to possibly represent stages of the same species. |
| 4. Sweep (<i>Girella simplex.</i>) | 2 to 3 lbs. | Autumn | Graball | — | Among seaweed in shallows | Autumn ? | Not common. |
| 5. Silver Bream (<i>Chrysophrys australis.</i>) | ½ to 3 lbs. | Oct. to March | Graball; hook & line | Crustacea | Estuaries; entering fresh water | Nov. and Dec. ? | Affords excellent sport with rod and line in the brackish waters of river estuaries, which it enters to spawn. |
| 6. Sea Carp (<i>Chilodactylus Allporti.</i>) | 5 to 6 lbs. | All the year | Graball | Crustacea; Brit | With Bastard Trumpeter among kelp | July and August | Caught most abundantly before westerly gales. |
| 7. Black and Silver Perch..... (<i>Chilodactylus macropterus.</i>) | 1 to 6 lbs. | All the year | Graball; hook & line | Crustacea; small fish | Adult, reefs and among kelp; young, entering bays & estuaries | With roe & milt, Aug. to Oct. | Common. |
| 8. Magpie Perch (<i>Chilodactylus gibbosus.</i>) | 1 to 2 lbs. | All the year | Graball | Crustacea | Among kelp | July and August | Not common. |
| 9. Real Trumpeter (<i>Latris hecateia.</i>) | 5 to 40 or 60 lbs. | All year through : largest fish, May to September | Hook and line; bait, Crayfish | Crustacea; Shrimps, Crabs, &c. | Reefs, 10 to 70 fathoms | Ova and Milt ripe, July and August | Two varieties; 1, "Deep Reef" variety, weighing 15 to 60 lbs., with ova and milt matured, from deep water; and 2, "Pair" or "School Fish," not exceeding 6 or 7 lbs. weight, with immature reproductive organs, from shallower water & ascending estuaries. |
| 10. Red and Silver Bastard Trumpeter (<i>Latris Forsteri.</i>) | 5 to 6 or 7 lbs. | Adult, Jan. to Mar.; young, all the year | Graball | Brit | Kelp banks and in estuaries 3 to 6 fathoms | March & April ? June & July ? | The fry of this species, known as "Paper Fish," enter the upper waters of the larger estuaries in large shoals. |
| 11. Real Bastard Trumpeter (<i>Mendosoma Allporti.</i>) | 5 to 6 lbs. | Winter | Graball | — | Reefs, among kelp | — | Not common; gregarious. |
| 12. Rock Gurnet (<i>Sebastes percoides.</i>) | 1 to 2 lbs. | All the year | Hook and line | — | Trumpeter ground | October ? | |
| 13. Flathead (<i>Platycephalus bassensis.</i>) | 2 to 3 lbs. | All the year | Hook and line | Young fish, especially flounders | Abundant everywhere; the finest on extensive sandy flats | Nov. & Dec. ? throughout the year ? | The commonest of Tasmanian edible fish. Have taken male with ripe milt end of July. |
| 14. Tasmanian Whiting (<i>Sillago ciliata.</i>) | ½ lb. | Nov. to Mar. | Seine; hook and line | — | Off sandy beaches | Spawns biennially, Mar. & Sept. | |
| 15. Barracouta (<i>Thyrsites atun.</i>) | 6 to 8 lbs. | Nov. to Aug. | Maori jig; cloth bait | Shoal fish, especially sprats | Surface of open sea entering estuaries | With roe in Dec., also in July | Gregarious. |
| 16. Kingfish (<i>Thyrsites Solandri.</i>) | 12 or 14 to 20 lbs. | Dec. to Oct.; most abundant May & June | Hook and line with chain and swivel, fish bait | Shoal fish | Surface of open sea | — | Gregarious. Occurs in vast numbers at fluctuating intervals. In the year 1875 it was so abundant as to be used extensively for manure. |

| | | | | | | | |
|---|---------------------------------------|--------------------------------|--------------------------------|--------------------------------|---|---|---|
| 17. Bastard Dorey (<i>Cyttus australis</i> .) | ½ to 1 lb. | April | Graball | Sprats and small shoal fish | — | — | Gregarious; appearing in large shoals at uncertain intervals. |
| 18. Horse Mackerel (<i>Trachurus trachurus</i> .) | ½ to 3 lbs. | All the year | Seine; hook and line | Small fish; Brit | Open sea, enter- ing estuaries | July and Aug. ? young in autumn ? | Gregarious; a cosmopolitan type, plentiful also in European seas. |
| 19. White or Silver Trevally..... (<i>Caranx Georgianus</i> .) | 10 to 12 lbs. | Midwinter | Graball, seine, hook & line | Small shoal fish | Open waters. | — | Gregarious. |
| 20. Yellowtail (<i>Seriola grandis</i> .) | 50 lbs. or upwards | Autumn | Hook and line | Small fish | North coast only | — | Gregarious. |
| 21. Snotgall Trevally (<i>Neptonemus brama</i> .) | 12 to 14 lbs. | March to May | Hook and line | Brit & small fish | Adult, deep water, mouths of estuaries; young, shallow | May to July | |
| 22. Mackerel Trevally..... (<i>Neptonemus dobula</i> .) | 2 lbs. | March to April | Graball; hook & line | Small shoal fish | Entering estuaries | — | Gregarious. |
| 23. Pike (<i>Lanioperca mordax</i> .) | 2 to 4 lbs. | Summer | Hook and line | — | — | — | |
| 24. Sand Mullet (<i>Mugil dobula</i> .) | 4 to 6 lbs. | Summer | Seine; hook and line | Mostly vegetable | Estuaries of northern rivers chiefly | — | Abundant, George's Bay. |
| 25. Sea Mullet (<i>Agonostoma Forsteri</i> .) | ¾ to 1 ¼ lbs. | All the year | Hook and line; seine | Animal matter generally | Bays & estuaries all round the coast | All the year through ? | Fry abounds at all seasons, so probably breeds all the year through. |
| 26. Stranger (<i>Odax Richardsoni</i> .) | 1 lb. | Autumn | Seine; hook & line | Crustacea | River mouths | | |
| 27. Rock Cod (<i>Pseudophycis barbatus</i> .) | At 2½ lbs.; deep water 8 or 9 lbs. | All the year | Hook and line | Crustacea, Pea Crab, Brit | Everywhere on rocky bottom | June to Aug ? Sept. | |
| 28. Tasmanian Ling..... (<i>Genypterus blacodes</i> .) | 7 to 15 lbs. | All year; chiefly in summer | Hook and line | Small fish | Rock or weed bottom, 3 to 8 fathoms. | | |
| 29. Tasmanian Sole (<i>Annotretis rostratus</i> .) | 1 to 2 lbs. | All the year | Seine | — | On sandy bottom | | |
| 30. Tasmanian Flounder (<i>Rhombsolea monopus</i> .) | ½ to 2 lbs. | All the year | Seine | Marine worms | Sandy bottom | June to Sept.; also Dec. | Apparently breeds nearly all the year through. |
| 31. Garfish (<i>Hemirhamphus intermedius</i> .) | ¼ to ¾ lbs. | April to Oct. | Seine, ¼-in. mesh | — | Among sea grass (<i>Zostera</i>) | — | |
| 32. Tasmanian Sand Eel..... (<i>Gonorhynchus Greyi</i> .) | ½ to 1 lb. | Winter? sum- mer? | — | — | — | — | |
| 33. Anchovy or Prettyfish (<i>Engraulis encrasicolus</i> .) | 5 inches | Nov. to March | — | — | River estuaries entering brackish water | — | |
| 34. Sprat..... (<i>Chupea sprattus</i> .) | 4 inches | Winter | — | — | Bays and estuaries | — | |
| 35. Conger Eel (<i>Conger vulgaris</i> .) | 7 to 50 lbs. | All the year | Hook and line | Small fish | On rocky bottom | — | |

Other species in addition to Trumpeter might be found worthy of attention ; while, apart from the edible varieties, there is no doubt that an assortment of certain of the more remarkably shaped and brilliant coloured fish peculiar to this region would be in great request in England for exhibition at any of the large public aquaria or other institutions such as the Zoological Societies Gardens, where living fish are placed on exhibition. The various species of trunk fishes (*Ostracion*), Porcupine Fish (*Diodon*), Leather Jackets (*Monocanthus*), and Parrot Fishes (*Labrichthys*), might be more particularly included in this category, and readily become accustomed to confinement in the tanks of an aquarium. By the working out of this suggestion a considerable economy in the cost of bringing out the proposed English food fishes to this Colony might be effected, since it may be anticipated that those availing themselves of the opportunities of obtaining the Tasmanian species would be willing to bear a share of the cost of the apparatus required for the transit of the specimens interchanged between the two countries.

In connection with the Fisheries Establishment at Battery Point, I have instituted a daily record of the temperature of the water in the tanks and tidal pond ; also, as occasion seemed desirable, of that of the adjacent sea. From this record much data of importance concerning the influence of the temperature upon the vitality and general welfare of various species of indigenous fish have been already gained. The water in the tanks in the hatchery being isolated and exposed to atmospheric influences on all sides, is naturally susceptible of a much wider range of variation than that of the open sea, and the same remark is applicable also to a certain extent to that of the tidal pond. The lowest winter temperature (June and July) so far experienced is that of 40° Fahr. in the tanks and tidal pond, the corresponding one in the open sea under equivalent conditions ranging from 48° to 50°. A few isolated observations made during the winter of 1885 gave the same result ; the lowest temperature registered at a depth of three or four fathoms in the open sea off Oyster Cove during the frost that continued uninterruptedly for the space of a fortnight in the month of July being 49° Fahr. Close in shore, with a low spring tide, early in the morning, and the water rising over the surface of the chilled land, the lowest temperature that has been registered is 40° ; this, however, with the inflow of the tide speedily rising to 48° or 50°. The desertion of the shore line by certain species of fish and their migration to deeper water during the winter season, is readily explained in association with this variation of the temperature. This relatively low temperature of 40° Fahr. registered in the tanks and tidal ponds exerted no marked effect upon the following species ; viz. :—The Real and Bastard Trumpeters, Gurnets, Flounders, Flatheads, Common and Ground Mullet, Sea Perch, and Native Salmon, beyond rendering them sluggish and disinclined to feed. The Tasmanian Whiting (*Sillago ciliaris*), on the other hand, were unable to withstand the low temperature, all of the several specimens confined in the tanks being lost. Under natural conditions, it would appear that this fish retreats to deeper and warmer water on the approach of winter. Quite unexpectedly, it was found that the Rock Cod (*Pseudophycis barbatus*) occupied the second position in the ranks of those deleteriously influenced by the cold weather. On the sudden advent of severe frost the first week in June, several specimens succumbed to exposure to the above-named temperature of 42°, and others, again, on being subjected to the lower one of 40° in the month of July. It might have been anticipated that the *Plectagnathous* species most abundantly developed in the tropical and sub-tropical seas, and represented in Tasmanian waters by various species of Leather Jackets (*Monocanthus*), Trunk fishes (*Ostracion*), and Porcupine Fish (*Diodon*), would have proved most susceptible to the fall of temperature. The varieties of *Monocanthus* experimented with, however, were totally unaffected by it, though some of the specimens of *Ostracion* and *Diodon* succumbed to the lower July temperature of 40°. The maximum and minimum temperatures of the sea water registered in association with the tanks and tidal ponds during the few months only that they have been so far established in their present location, are as follows :—

| | Maximum. | Minimum. |
|-----------------------------|----------|----------|
| March (last week only)..... | 68° | 54° |
| April | 66° | 48° |
| May | 58° | 46° |
| June | 53° | 42° |
| July | 52° | 40° |
| August | 52° | 44° |

The record above given when further extended will, it is hoped, prove of service in the operations that may be conducted with the view of acclimatising European fish in Tasmanian waters, or the converse. Much of the success of such an undertaking depends upon the knowledge of the habits of the species and the selection of seasons when the temperatures of the two regions shall as nearly as possible coincide. Another direction in which a record is being preserved at the Fisheries Establishment relates to any marked changes that may occur in the salinity of the water and its effect upon the species cultivated. In the second week of May of the present year the sea water in the Derwent estuary, including necessarily that in the enclosed ponds, was reduced by the accession of flood-water to one-half only of its usual density. During this condition, which lasted for over one week, the pumping machinery was disconnected from the pond and circulation effected from the reservoir beneath the building, the normal density being by this means maintained in the tanks. The ordinary species of fish left in the pond were not affected by the reduction of the salinity, and the same may be recorded of the considerable stock of oysters. On the other hand, the entire series of another edible mollusc, the Scallop, including three species—*Pecten bifrons*, *P. exoctandus* (*fumatus*), *P. asperimus*—were entirely destroyed, and a similar fate befell the several examples of

Crawfish (*Palinurus Edwardsi*) confined in the same pond. The deleterious effect of a superabundance of fresh water upon these crustacea is well known to the fishermen, it causing them, to use their own expression, to "burst up," or, as it would appear from an examination of specimens that have been killed in this manner, to absorb by endosmosis so much of the diluted element into their systems that their tissues swell out beyond the retentive capacity of their shells, which are burst asunder, death ensuing. From this cause in flood times the fishermen lose a large quantity of the stock stored in floating coffers close to the docks. A variety of Star-fish and Echini experimentally exposed to the same influence were killed without any exception, a circumstance that indicates the advantages that must accrue to oyster-beds established in localities subject to periodical but at the same time moderate freshets, and who would at such times be freed from these natural enemies.

It is worthy of note in connection with the foregoing record, that observations concerning the temperature and density of the water, and their direct and indirect influences upon all descriptions of food fishes, are included among the subjects specially enumerated by the Scientific Committee of Advice in their recent Memorandum to the Board of Trade with relation to the functions that should be discharged by the Staff of Naturalist Inspectors it is proposed to appoint to the newly created English Fisheries Department.—(Vide "Nature," June 24, 1886.)

3. *New or Rare Fish taken in Tasmanian Waters.*

A brief account may be appropriately given in this Report of the fish taken in Tasmanian waters in or about the last twelve months which are either of exceedingly rare occurrence or are altogether new to the district or to science. Included among the specimens that have been brought to me by the local fishermen and temporarily placed in the tanks, I may more particularly refer to a singular variety of the Trumpeter family, which as recognised by its captors could not be precisely referred to either the Real Trumpeter (*Latris hecateia*), or to the Red or Silver Bastard Trumpeter (*Latris Forsteri*), but embraced the characteristics of both. The general contour of the fish most nearly resembles that of the Real Trumpeter, while the colour and markings of its body correspond most closely with those of the mature Silver Bastard, consisting of a pearl grey ground with horizontal lines and reticulations of light brown and tawny yellow extending throughout the dorsal region to a little below the lateral line. The fins, are, however, of a more pronounced yellow than in the Silver Trumpeter, with a tendency to green on the pectorals and ventrals, recalling in this respect the characters of the Real Trumpeter. There is also an entire absence of the black edging to the pectoral, caudal, and hind dorsal fins that is so characteristic of the Silver Trumpeter. The more important structural features of the specimen under discussion are presented in the following formula:—

D. 17: 1-39. A. 3-32. P. 9-9. V. 1. 1.4. L. lat. 110. Two conspicuous vomerine teeth.

Compared with that of the Real Trumpeter the above formula coincides in the development of the anterior or spinous portion of the dorsal fin, in the number of scales on the lateral line, and in the presence of teeth on the vomer, though these are less in number than those which occupy a like position in the Real Trumpeter. In the Silver Bastard Trumpeter there is invariably one spine less, or sixteen only, on the anterior dorsal fin; the scales along the lateral line range from 115 to 120, and there are no teeth whatever on the vomer. The number of jointed fin rays of the posterior portion of the dorsal fin corresponds with those of the Silver Trumpeter, while the remaining elements that make up the formula, being common to both species, cannot be comparatively quoted. Comparisons that have been instituted show that this fish is even less closely related, structurally, to the form known as the New South Wales or New Zealand Trumpeter (*Latris ciliaris*), which has rarely been taken in Tasmanian waters. In that species, according to the original diagnosis, there are only six simple pectoral rays. The number of scales along the lateral line does not exceed 84, and there are no vomerine teeth. Taken collectively, the characteristics presented by the specimen described combine in so remarkable a manner those that distinguish respectively the typical examples of the Real and Silver Bastard Trumpeter that is difficult to avoid the suspicion that it possibly represents an accidental hybrid between the two species. Parallel cases of hybridism, as is well known, occur or may be brought about by artificial agency, among the races of the salmonidæ. The greatest obstacle to this suggested interpretation is associated with the character of the dentition, there being two teeth only upon the vomer compared with the six or eight occupying the same position in the Real Trumpeter, while in all other described species there are no teeth whatever in this region. This circumstance would almost seem to warrant the recognition of this abnormal individual as the type of a new species. Should further investigation substantiate its claim to such distinction it is proposed to confer upon it the title of *Latris Mortoni*.

Another fish obtained by the fishermen, and preserved alive for some time in the tanks of the fishery, is referable to the family *Blenniidae*, including a variety of mostly small shore-frequenting fish, locally known as Bullies, or Blennies. The specimen under notice belongs to the genus *Clinus*, but differs from the single species, *C. despicillatus*, hitherto taken in these waters, and which averages the length of 4 or 5 inches only, in its larger dimensions, 15 inches, in the great development of the nostril tentacles, and in other characters of specific value. I have proposed to distinguish this hitherto undescribed fish by the name of *Clinus Johnstoni*, the specific title being associated with that of Mr. R. M. Johnston, F.L.S., author of a Descriptive Catalogue of the Fishes

of Tasmania, and to whom science is much indebted for the already advanced position of our knowledge of the fish fauna of this Colony. A third unfamiliar variety, obtained from the neighbourhood of George Town in the autumn of 1885, has been identified with the Rock Perch of the Melbourne fishermen (*Glyphydodon Victorice*): the occurrence of which species upon the Tasmanian coast is now recorded for the first time. A specimen of interest captured during the month of June, 1886, near the Schouten Islands, in company with the common form of Crawfish, or so-called Crayfish (*Palinurus Edwardsi*) is a species of the same genus, which, on comparison, has been found to be identical with *Palinurus Hugellii*, the type common to New South Wales, and occurring also on the coasts of North Island, New Zealand, but not hitherto included among the Tasmanian species. Enquiries instituted have elicited that, although rarely brought to market, this Crawfish is not unfrequently captured by the fishermen. As a food species it is regarded as inferior in quality to the common market type of this Colony. A detailed account of the several new or little known types just enumerated has been prepared for communication to the August meeting of the Royal Society of Tasmania.

I am indebted to Mr. Alexander Morton, the Curator of the Tasmanian Museum, for the following list of new or rare fish that have been recently added to the natural history collection of the above-named institution:—1. The Hapaku (*Oligorus gigas*), one of the edible fishes of New Zealand that occasionally finds its way to these shores; average weight 45 to 130 lbs. The specimen in the Museum was captured off the Hippolyte rocks, at a depth of 40 fathoms; weight 53 lbs. 2. The Frost-fish or Hiki of the Maories (*Lepidopus caudatus*), plentiful at times in New Zealand, but rarely seen in Tasmanian waters. This fish has an almost cosmopolitan distribution, being abundant in the North Atlantic, and is known among British species as the Scabbard Fish. The specimen in the Museum, a young example, was captured in the Derwent. 3. The New South Wales or New Zealand Trumpeter, "Moki" of the aborigines, (*Latris ciliaris*), a specimen obtained in September from George's Bay. 4. The Tailor or Skip Fish of the Sydney markets, (*Temnodon saltator*), new to Tasmania. 5. The Pig Fish of the Sydney fishermen (*Casyphus unimaculatus*), common in New South Wales, new to Tasmania. 6. Parrot Fish (*Labrichthys Mortoni*, Johnston), hitherto undescribed, obtained from George's Bay. Specimens have likewise been received, and are now living at the Fisheries establishment. 7. *Erythrichthys nitidus*, a rare fish, occasionally taken in Tasmanian and New Zealand waters. 8. Allport's Perch, (*Callanthias Allporti*), a rare and recently described species obtained from George's Bay.

Among the more valuable food fishes of this Colony, it is worthy of record that the species known as the "King-fish" (*Thyrsites Solandri*), some years ago so abundant in Tasmanian waters as to have been taken in tons and sold for manure, but which from that time to the present year has been scarcely seen, has again put in an appearance, and during the past season has been placed upon the market in considerable quantities.

4. Fishery Statistics.

An endeavour has been made during the past year to obtain reliable returns of the quantities and varieties of market fish that have been landed at the various ports of Tasmania or dispatched to the adjacent Colonies. It has not been found possible, however, to obtain sufficiently unanimous returns from the fishermen in time for incorporation with this report, and it is anticipated, in fact, that complete returns, that are alone of value, are to be collected only in conjunction with the compulsory registration of all fishing craft, presently suggested.

5. Trial of new Fishing Apparatus.

Following out the proposition contained in my last year's Report, the experiment has been made of importing certain of the English fishing appliances hitherto unused in this Colony, with the view of testing their efficacy when applied to the special fisheries of Tasmania. The results attending the trial of one description of apparatus known in England as the "trammel net," and used extensively on the coast of Devonshire and the Channel Islands has been eminently satisfactory. This description of net is of French origin, its name being a corruption of "trois mailles," or three meshes, indicative of its peculiar construction. It consists essentially of a loose net of small meshes, or "sheeting," which is suspended between two tighter nets of larger meshes which are called the "walling." The average gauge of the meshes of these respective nets is an inch and a half or two inches for the sheeting, and twelve inches for the two outer nets or walling. The net is used after the manner of the ordinary graball, the foot-line being weighted and leaded, and the head-line being corked and buoyed. From whichever side fish approach and attempt to pass this net, they push before them a portion of the finer and slackly hung sheeting through one of the apertures of the walling, and become, as it were, enclosed in a bag or pocket, from which there is no escape. In all instances where the graball, which corresponds with the ordinary English "gill" or sheet net, is used in this Colony, the trammel may be employed, and is in fact found to be far more efficient, catching many species, such as Flounders, which are rarely taken with the graball. During the past autumn the experiment was tried in the neighbourhood of Spring Bay of setting a trammel and graball of equal length, or about thirty-five fathoms, and under as closely corresponding conditions as could possibly be obtained. For every four or five fish caught in the graball there was invariably a score or more in the trammel. The verdict of the fishermen after a few trials was that it was not worth their while taking the graball out when they could have the

use of the trammel, to which was added an expressed intention of converting their own nets into trammels at the earliest opportunity. This can be easily done by the addition of outer walls of twelve-inch meshing, care being taken that the inner net or sheeting is hung loose enough to allow sufficient slack for the fish to pocket themselves. The proportions recommended in this respect are to make, say, a trammel thirty fathoms long, that the outer wallings should correspond with that length, while the sheeting should when stretched out be of exactly double this length, or sixty fathoms, the vertical measurement being in a similar ratio. In other localities where the trammel has been tested equally gratifying results have been obtained; and there is no doubt that its substitution for the graball on an extensive scale would prove highly profitable to the fishermen. So soon as opportunities permit it is proposed to experiment with this description of net in the deeper waters frequented by the large Real Trumpeter, and in the capture of which species it is anticipated that it will prove very effective. A special advantage attached to the use of the trammel is that the fish, if carefully extracted from it, escape the injuries they are liable to receive when caught by the head or gills as in a graball, and are consequently stronger and fitter for preservation for long periods in the boat's well or floating coffers.

Another description of fishing apparatus that has been imported from England for trial in Tasmanian waters is a trawl, chiefly used in England for taking turbot, brill, soles, gurnet, skate, and all other descriptions of bottom-frequenting fish. It has been suggested that the employment of this machine in suitable localities off the Tasmanian coast would probably produce results that might lay the foundation of new fishing industries. Opportunities have not yet been afforded of testing this apparatus beyond the bays and reaches of the D'Entrecasteaux Channel, and which, as so far explored, have proved either too foul-bottomed for its effective working or deficient in species of commercial value suitable for this method. I have been informed by Mr. J. B. Grane, of Formby, who experimented with a similar trawl upon the North Coast a few years since, that he found it very profitable for the capture of flounders and the so-called Tasmanian Sole, the fish there captured, some distance out at sea, being much finer than those usually taken in-shore with the seine. I shall hope to be in a position to submit more extensive evidence concerning the practical utility of this description of fishing apparatus in my next report. The special form of trawl alluded to in this paragraph as having been procured from England is that known as the "Otter Trawl," and which, while equally as efficient as the common or "Bream Trawl" in its practical working, has the advantage of being much less cumbersome to handle, and is capable of being stowed away on board ship in a very much smaller space. As an addition to the ordinary method of hand-line fishing, I have experimentally introduced the use of what is known in England as a "Long Line," "Trot," or "Boulter." This consists of a long line, weighted, and laid along the sea bottom with a baited hook fastened to it about every two yards. Such apparatus, although so far only tested on a small scale, has proved very effective for the capture of flathead, rock-cod, perch, and all other estuary fish usually taken by the hand-line, and, in many instances, yielding a good return when adjacent boats fishing with hand-lines have been altogether unsuccessful. In England similar lines of a more substantial make, and carrying, it may be, as many as a thousand hooks, are used in deep water for the capture of cod, conger, turbot, and other market varieties. The employment of these lines in the deep-sea fisheries for Real Trumpeter off the Tasmanian coast would probably prove remunerative.

6. *Development of the Fishing Industries.*

With respect to the further development of the sea fisheries of this Colony, it has been urged upon my attention that, considering the abundant supplies of fish that might be obtained by the adoption of newer methods, and a more extended and systematic plan of working the fisheries and disposing of their produce, it would be well worth the while of capitalists to devote some attention to this branch of commerce. So long as this industry is left only to the local fishermen and their agents, but little progress can be anticipated. As a matter of fact, this class, with but few exceptions, are entirely indifferent to any improvement in the working of their vocation. Many frankly express the opinion that they do not want to increase the supply of fish, and that the introduction of methods by which their takings would be augmented would not be acceptable. The capture of a small supply of fish, and the sale of the same at a high price, is more in accordance with their aims than providing the public with abundance of fish at a cheap rate. The present high price of fish, weight for weight, is considerably dearer than butcher's meat, and, notwithstanding its plentifulness, would, but for the foregoing facts, seem about inexplicable; nor until steps are taken to place it before the public under different auspices can any material abatement in its price be expected. The provision of suitable accommodation for the sale of fish in the retail market, as brought direct from the boats, and without the intervention of middlemen, would be a solution of the problem, though under existing conditions a somewhat difficult one to accomplish. The present fish market is, in its practical working, a purely wholesale one for the benefit only of the larger salesmen and itinerant hawkers, to whom are transferred the takings of the fishermen within a few brief minutes after the opening of the market at the early hours of 6 A.M. during the summer and 7 A.M. in the winter months. If it were possible to establish a retail fish market, or an equivalent subsection of a general market, where, as at all English seaport towns, the women of the fisherman's family dispose of the fish taken by the husband or other male members of the household, the public would reap the advantage of getting fish at a cheaper rate, and the fishermen a better or retail price for their takings.

A like result for the public benefit, attended with large profits to the initiators of such an enterprise, might be brought about through the medium of a company established, as previously suggested, for developing the fisheries of this Colony upon the most modern principles. As an illustration of the application of such a suggestion in connection with the British sea fisheries, it may be mentioned that, as a practical upshot of the conferences and discussions on the question of fish supply at the Fisheries Exhibition, London, 1883, a great Grimsby firm tried the experiment of placing their fish on the London retail markets direct from their North Sea fishing boats, and without the usual passage through Billingsgate, much to their own and the public advantage. The scope of such a proposed fishery company in Tasmania should, however, reach beyond the supply of the local demand. The coasts of this colony teem with a sufficient fish supply for the establishment of a large export trade, whose development up to the present time may be said to have been scarcely broached. With the assistance of welled-smacks, such as are used in the English North Sea fisheries, valuable cargoes of living fish might be regularly placed upon the Melbourne and Sydney markets. The cost of a welled-smack of first-class build and large size, 68 tons, amounts in England to about £1500, such a smack conveniently carrying in one load from twenty to twenty-five score of live codfish of the largest size, provision being made at the same time for the packing and carrying about two-thirds of the same quantity stored in ice. Large trumpeter would take up about equal space, while the market price is so much higher that the profits derived from each voyage with a full cargo of, say, seven or eight hundred fish, should, after deducting all expenses, be something considerable. A welled vessel of the dimensions above quoted would have the further advantages of being able to remain on the fishing-grounds and continue operations during weather in which the small craft at present employed in this industry have to return to port or dare not venture out. Although no well-craft of the dimensions above quoted has as yet been employed in Tasmanian waters, it is worthy of note that such a vessel of 20 tons burthen, the *Rachel Thompson*, owned by Messrs. L. and D. Jones, and built at Sydney, has for some years been engaged in capturing and conveying cargoes of living trumpeter to the Melbourne market. With the fuller and more extended development of the Tasmanian fisheries it may be anticipated that a fleet of this advanced type of fishing craft will find profitable employment. With a zeal for their calling worthy of emulation, it may be here mentioned that the owners of the above-named vessel have shown themselves eager to experiment with fishing appliances other than those commonly used in this colony. In this direction they have recently introduced lobster-traps as used in England for the capture of the indigenous crawfish, and, they inform me, with very favourable results, a greater number being obtained under ordinary conditions by traps than with the usual ring-net. A further advantage attached to this trap system is that, whereas the ring-nets require attention at frequent intervals, the traps may be left down for many hours, or, as usually happens, throughout the night, whilst other fishing operations are proceeded with. The department of fish-curing and preserving on a large scale for the export trade may be recommended as likely to prove a lucrative branch of a fishery company's undertakings. Such curing operations should not be confined, as hitherto, merely to the smoking of trumpeter, barracouta, carp, and similar ordinary market fish. A new field might be developed in the direction of preserving in oil with bay leaves and other flavourings, after the manner of sardines, the sprat-like representatives of the herring tribe that at times abound off these coasts, and a like process would probably be found to answer if applied to other species that may be obtained in inexhaustible numbers, such as the Tasmanian Garfish (*Hemirhamphus intermedius*), and the young of the Native Salmon (*Arripis salar*). The Anchovy (*Engraulis encrassicholus*), which abounds at certain seasons in the Derwent and Tamar estuaries, and is not to be distinguished from the renowned European species, would of itself provide material for remunerative enterprise. For the successful prosecution of the suggested Sardine and Anchovy industries, it would be found most advantageous to secure the services of one or more skilled specialists from Europe. In order to conduct their operations on the most profitable basis, such a fisheries company should be provided with a variety of gear, hitherto unused in this Colony, but specially adapted for the capture of the species in request. The various descriptions of "drift nets" used in the home fisheries for the taking of all sorts of floating fish, from sprat up to salmon, would beyond doubt prove eminently suited for the capture of many Tasmanian species, and to which might be added Trawl, Trammel, Boulter, or long-line fishing, &c. The question has been raised whether, in the event of a company being formed on the lines indicated to more fully develop the natural resources of the Colony, a certain amount of direct or indirect aid, as in the mining industries, might not be expected from the Government? Indirectly, I should be inclined to advise that such assistance be given to the extent of the Government bearing the cost of the importation of the various descriptions of fishing gear, and of testing them through the Fishery Department, in order to arrive at a correct estimate of their utility in Tasmanian waters; also, through the same Department, to give any other practical assistance feasible in the development of the new branches of the fishing industries. In a more direct manner the subject might be favourably entertained by the Government of awarding a bounty for the first given quantity of Anchovies, Sardines, or other fish successfully preserved by methods hitherto unattempted in this Colony.

7. Proposed Registration of Fishing Craft.

As a means toward arriving at reliable statistics, and towards promoting the more systematic development, of the Marine Fisheries of this Colony, I strongly recommend that all the craft employed

in taking fish for the purposes of sale should be registered, and have affixed to them numbers or letters indicative of the ports from whence they hail. The system and regulations adopted for such registration might be made identical with that which is applied to the home fisheries, as embodied in Part II. of "The English Sea Fisheries Act, 1868," 31 and 32 Vict., Chap. 45, and a brief summary of the more essential clauses of which is herewith annexed:—

"The following regulations shall be in future observed by owners and masters of all British boats or vessels hailing from or belonging to any port or place in the United Kingdom, the Islands of Guernsey, Jersey, Alderney, Sark, or Man, of whatever size and however propelled or navigated, which find any portion of their ordinary employment in sea fishing, oyster or mussel dredging, for purposes of sale.

Each sea fishing vessel or boat, whether registered under any other Act or not, shall be lettered or numbered and have a certificate of registry, and shall for that purpose be entered or registered in a register of sea fishing boats to be kept at the principal office of Customs in each collectorship.

There shall be a series of numbers and distinguishing letters for the boats belonging to each collectorship of customs or port of registration.

For the purposes of numbering, lettering, and registration, boats shall be divided into three classes, as follows:—

1st Class.—Boats of 15 tons burthen and upwards.

2nd Class.—Boats of less than 15 tons burthen, navigated otherwise than by oars only.

3rd Class.—Boats navigated by oars only.

In sailing boats and boats occasionally navigated by the use of sails, the letters and numbers to be placed on each bow, and on each side of the mainsail. For boats of the third class the letters and numbers shall be placed on the outside of the stern of the boat, immediately under the name."

A blank registry form, indicating the various data concerning the fishing boats and vessels that are required to be furnished on granting a certificate, is given below.

Sea Fisheries Act, 1868, 31 and 32 Vict., Cap. 4.

Port of _____

REGISTRY OF VESSELS AND BOATS ENGAGED IN FISHING.

| Date of Registry. | Name of Vessel. | Port or Place to which belonging. | Name of Owner. | Name of Master. | Description. | | Registered No. | | | Size. | | No. of Crew usually employed. | | Remarks. |
|-------------------|-----------------|-----------------------------------|----------------|-----------------|---|---------------------------|----------------|------------|------------|----------|-----------------|-------------------------------|-------|----------|
| | | | | | Of Vessel or Boat, how rigged, what Sails used, &c. | Ordinary mode of fishing. | 1st Class. | 2nd Class. | 3rd Class. | Tonnage. | Length of Keel. | Men. | Boys. | |
| | | | | | | | | | | | | | | |

So far as the fishing craft of Tasmania are concerned, there is at present but one boat, the *Rachel Thompson*, 20 tons, that would fall within the first-class category,—all the others belonging to the second and third classes. The latest estimated number (1883) of the craft employed in the fishing industry of Tasmania is 86, manned by a total of 175 men.

In place of the Customs, it might perhaps be found more convenient to relegate the registration of the fishing craft of this Colony to the Marine Board. Whether the certificates of registration should be given free, or whether, as in New South Wales, in place of a certificate, a licence with attached fees on a graduated scale should be granted to the various classes of fishing craft, and also to all individuals who take fish for sale without the aid of boats, may be left for future determination. As a matter of fact, the institution of a moderate licence fee, such as One Pound per annum for boats of First class size, Ten Shillings for those of the Second class, and Five Shillings for the smallest or Third class, would not be regarded with disfavour by the fishing community, since the obligatory tenure of such a licence would tend to retain the supplying of fish in the hands of the *bonâ fide* fishermen, and prevent, to a considerable extent, the alleged injury to their trade caused by the not unfrequent placing on the market of supplies taken and forwarded by those who are not dependent upon the produce of the fisheries for their livelihood. The licence fees imposed on fishing craft and on fishermen pursuing their vocation, with or without boats, in New South Wales are Five Pounds per annum for every steam-boat, and One Pound for every other description of boat, large or small, employed in the capture of fish for sale, and Ten Shillings per annum for every person employed in catching fish, lobsters (crawfish), crabs, or prawns in or upon any waters, either salt or fresh, for a like purpose.

In connection with the tenure of their Licence or Registration Certificate, I would suggest that it should be made compulsory for the holders to furnish a periodical return of the quantities and description of fish they bring to market. Without the introduction of some such regulation it will be scarcely possible to arrive at an accurate estimate of the annual value of the fishing industries of this Colony, or of recording from year to year their relative progress or retrogression.

8. *Sponge Fishery.*

In my last Report I drew attention to the circumstance that examples of sponges closely allied to the ordinary sponge of commerce, *Ensporgia officinalis*, were not unfrequently washed upon the shore in the neighbourhood of Spring Bay and Maria Island. Since then water-worn examples of even superior quality, and which, if gathered fresh, would be available for domestic purposes, have been gathered in the neighbourhood of Swan Island, and remitted me, by Captain Stanley, R.N. In consequence of this discovery, I proposed to undertake the investigation of the sea bottom in the district named, with the view of ascertaining the precise habitat and conditions of growth of these sponges, and, in the event of such investigation proving successful, further experimenting in the direction of their artificial culture. The search for the natural habitats of these sponges up to within a recent date was not rewarded with success. While occupied in the preparation of this Report I have, however, received intelligence of the discovery of one or more reefs producing them towards the north of Oyster Bay on the East Coast. At an early date I propose to proceed to this locality and make myself personally acquainted with the circumstances of their growth, and, in the event of their quality proving sufficiently good, to ascertain if they are to be obtained in sufficient quantities for trade purposes, and possibly to supervise the formation of a small sponge farm in connection with one of the oyster reserves at Spring Bay.

9. *The Crayfish Fishery.*

In accordance with the recommendations made in my two last reports, 1884 and 1885, a Bill has been framed, and received the sanction of Parliament during the past Session, providing for the better protection of the market crustacean commonly known as the Crayfish or Crawfish (*Palinurus Edwardsi*.) In pursuance with the provisions of the Act 49 Vict. No. 27, entitled "The Crayfish Protection Act, 1885," the sale or possession of any crayfish measuring less than 10 inches from the extremity of the head to the extremity of the tail or telson, or of any female fish, of whatsoever size, having eggs or spawn attached beneath its body, or which has been captured with eggs or spawn so attached, is rendered illegal, transgressors of the Act being subject to a penalty not exceeding five pounds.

SECTION B.—FRESHWATER FISHERIES.

1. *Salmonidæ.*

Details concerning the precise distribution of the 30,000 odd fry of the true salmon (*Salmo Salar*) successfully reared from the consignment of 150,000 ova imported last year by the s.s. *Yeoman*, will be found in the Report of the Salmon Commissioners. In accordance with the recommendations made in my last year's Report, the larger portion of these fry were liberated at an early date, soon after the absorption of their umbilical vesicle, and a very considerable number of them placed in the Mersey, Forth, Esk, and other rivers of the northern watershed, which, in consequence of not being already overstocked with Brown Trout (*Salmo fario*), and in combination with their natural qualifications, I recommended as especially suited for the acclimatisation of this species. From the River Mersey more particularly I am in a position to report a very satisfactory account of their progress. During the autumn specimens in the parr condition were remitted me for identification, having been accidentally captured while fly fishing for the Native Herring or Grayling (*Prototroctes Marina*). These had already grown to a length of six inches, and were well formed and in excellent condition. So far as it is possible for human agency to determine, the establishment of the true salmon in the above-named river at least, is, I consider, assured.

During the past year the recommendation made in my last Report, accompanied by an illustrated plan, for the construction of a combined pound and fish-way in the River Plenty, in close vicinity to the Salmon Ponds, has been carried out. As a pound it has already proved highly successful and of great service for securing examples of the Sea or Salmon Trout (*Salmo trutta*) for artificial spawning purposes; it will, however, prove of yet greater utility when applied to a like purpose in association with the artificial propagation of the true Salmon now in course of acclimatisation.

Concerning the development of the Salmon Fisheries generally, and in view of the almost certain prospects of the acclimatisation of the true Salmon in Tasmania, I feel it incumbent upon me to reiterate the recommendations made in my last year's Report relative to provision being made for the more efficient protection of the rivers in which they have been placed. As then, I advocate the appointment of District Boards, constituted upon the lines of the Boards of Conservators in England, and to whom shall be similarly assigned all functions and authority within their respective districts relative to the following subjects:—1. The initiation of legal proceedings against all persons violating the Salmon, Trout, and other Freshwater Fisheries Acts. 2. The appointment of water-

bailiffs, or other duly authorised officers employed in the conservation of Salmon, Trout, and other protected freshwater fish. 3. The execution of such works and the incurrence of such expenses as are provided for in the yearly estimates for the protection and improvement of the Salmon, Trout, and all freshwater fisheries. 4. The issuing of such licences for fishing as are provided for by the Acts. 5. The seeing that fish-passes are provided and maintained in a state of efficiency in association with all artificial dams and weirs, and in accordance with "The Salmon Act, 1878."

For the present requirements of the Colony two such Boards, the one having jurisdiction over the rivers of the Southern, and the other over those of the Northern District, would, in my opinion, be sufficient. As originally suggested, the Board for the Home or Southern District might be most appropriately composed of members of the present Salmon Commission, while for the constitution of a Northern District Board, a sufficient number of gentlemen residing in the neighbourhood of Launceston, and who take a practical interest in the various fisheries of that district, have already volunteered their services, and to these might be added selected representatives from other of the more important Northern riverine townships. Under whatever auspices the more efficient control of the Freshwater Fisheries of this Colony and the carrying out of the existing laws relating thereto may be effected, it is very desirable that action should not be long delayed. If the true Salmon is to be established in the rivers of this Colony, it is imperative that they should be efficiently protected from the wholesale destruction by illegal methods or by unauthorised persons, to which down to the present time the other acclimatised members of the *Salmonidæ* have been subject. In order to accomplish this, it is desirable that additional water bailiffs should be appointed for the protection of the districts that are more particularly exposed to depredations of this description. The River Derwent throughout that portion of its course along which the new railway works are now in progress might, for example, be advantageously placed under much stricter supervision. Provision should likewise be made for the special protection of the fish on their arrival in the well-known spawning beds of the various tributaries of this and other rivers of the Colony, and where hitherto they have been much disturbed. Another direction in which the stricter administration of the law is particularly desirable, relates to the required construction of fish-passes at all dams and weirs where hitherto no such provision has been made for the unimpeded progress of the fish up the river; also with reference to the required erection by mill-owners, or other responsible persons, of screens or gratings at the entrances of any channels through which water is diverted from rivers stocked with salmon, for the working of any mill or for irrigation purposes. It is a known fact that large numbers of other migratory *Salmonidæ*, when descending the rivers in their smolt condition during the spring months, have been hitherto destroyed through the non-observance of these regulations; and it is exceedingly desirable that steps should be taken for their full enforcement before the descent towards the sea, this coming spring, of the shoals of salmon smolts developed from fry liberated in the rivers last year. Unless, in fact, this exceedingly important matter is immediately attended to, it will inevitably result in a further regrettable waste of the considerable sums already expended in the attempted acclimatisation of this fish. In the various rivers of the north, which are now for the first time stocked with salmon, attention to the above-named regulations is particularly needed; and it is, I think, very necessary that a systematic inspection of these and all the other salmon-stocked rivers should be immediately undertaken, with the object of indicating those localities where the application of the foregoing regulations is most urgently needed, and in order to make provision for their effectual enforcement. In connection with the River Mersey, now stocked with salmon, I would recommend that a combined fish-pass and fish-pound, similar to that on the River Plenty, be constructed at the point known as Bonney's Weir, Latrobe; and that, in association therewith, a small hatchery be established for the purpose of dealing with supplies of salmon ova and fry, bred from Mersey fish, for distribution further afield. There are residents in the neighbourhood who would willingly undertake the management of this proposed hatchery during the few weeks only in the course of the year that operations would be in force; and no more suitable spot could be selected as a breeding station from which salmon fry might be conveyed and placed in the many eminently suitable but hitherto almost inaccessible rivers of the north-western and western districts of the Colony. Such a hatching station would naturally fall within the control and jurisdiction of the suggested Northern District Board of Conservators.

A direction in which the Fisheries Establishment at Battery Point might be made subservient to the acclimatisation of the true Salmon in this Colony would be through the transport thither from the breeding ponds on the River Plenty of a certain number of smolts bred from the ova imported last year, so soon as they are ready to descend to the sea. By introducing them first into tanks containing an admixture of salt and fresh water, and finally into the enclosed salt-water ponds, they might be retained there until ready to re-enter the rivers as grilse, or full grown salmon, and, in the latter instance, prepared to deposit their spawn. It would be feasible, in fact, under these conditions, to keep a small breeding-stock of salmon permanently under control, and I would therefore recommend that facilities for carrying this suggested experiment into practice be placed at my disposal.

A subject that must in the near future engage the attention of the authorities to whom the conservatorship of the salmon and other freshwater fisheries of the Colony shall be confided is, as to whether such fisheries shall be, as in England, self-supporting, or whether they shall be maintained more or less completely at the expense of the Colony. From the low rate of the existing licence fee,

ten shillings for the season, for the privilege, however, of taking Trout and Salmon Trout only, a revenue sufficient for the effectual conservation of the various rivers can scarcely be anticipated. For a *bona fide* Salmon Fishery, however, the licence fee might very reasonably be raised, while at the same time provision hitherto wanting might be made for the advantage of the many anglers, visitors to the Colony, who would gladly devote a few days to such sport, but at the same time object for such a brief period to pay the fee charged for the entire season. It is also a matter for consideration whether a lower fee, of, say, five shillings for the season, should not be charged for a fishing licence for Trout, Salmon Trout, Cucumber Mullet, or Grayling, Blackfish, and all other species than Salmon, taken with the rod and line. The imposition of such a licence fee would, I have been assured, be approved by a considerable portion of the anglers of this Colony, and the revenue derived from such a source would provide the means towards dealing far more effectually than hitherto with the conservation of the various rivers. During the past twelve months, in consequence of the ineffectual manner in which the waters of the Derwent estuary have been protected from illegal netting, the seine fishermen of Hobart have presented a petition asking, during the three hotter summer months, to be allowed to use seine nets in the river up to the point known as Risdon Ferry. The contention raised in their petition was, that whereas seine nets were extensively, though illegally, used in the area defined for the capture of Flounders for the Hobart market, the law-abiding fishermen were placed at a great disadvantage, having to go much farther for their supplies, and which, when brought to market, were not in a condition to compete favourably with those illegally taken nearer home. The granting of this petition was not considered feasible, and the only practical method of removing this undoubted grievance of the seine fishermen would appear to be the more efficient protection of the river, combined with the prohibition of the use of nets of any kind whatever from above a line intersecting Kangaroo Bluff, on the east, and Perry's Point, on the west, shores of the Derwent estuary. The establishment of such a regulation is, I consider, very desirable in the interests of the Salmon Fisheries in their present early and immature condition. In my last Report the more extensive co-operation of the local constables in the conservation of the freshwater fisheries of this Colony is, as now, strongly advocated; their aid might also be more extensively utilised than hitherto in the enforcement of the regulations of the several Sea-fisheries Acts. Should the growing opinion in favour of the centralisation of the police take a substantial form, the assistance obtainable in this direction would, I need scarcely suggest, be greatly facilitated.

A matter which affects the well-being of the acclimatised migratory *Salmonidæ*, and also that of the marine fish that enter the Derwent estuary, is that of river pollution. Under existing circumstances the amount of sewage discharged into the river from the town of Hobart would appear to exert no detrimental effect. This is practically illustrated by the vigorous state of health of the many varieties cultivated at the Fisheries Establishment, Battery Point, in water drawn from the estuary. In the event, however, of the newly proposed drainage scheme being carried into practice, and whereby water-closets will be substituted for the present almost universal cesspits, and their contents discharged into the estuary close to the town, its effects upon fish life in the river can scarcely fail to be deleterious, and these effects will necessarily increase with the growth of the city. Were these sewage products conducted through a single main and discharged well into the tideway at a point, say, immediately beyond Droughty Point, all danger would, I consider, be averted. According to the published plans, however, there will be several outfalls near to the town, including one at the mouth of Sandy Bay Rivulet in close proximity to the Fishery. A large portion of the discharged matter will not fail under these conditions to accumulate, as does seaweed and other floating substances at the present time, in the several inlets of Sandy Bay above the point indicated. The effect of such accumulations upon the public health will, I need scarcely say, be the reverse of beneficial, while, in the case of the Fisheries Establishment, it will necessitate its removal to more salubrious quarters. A subject affecting river pollution and its influence upon the fishing industries of this Colony that needs more immediate attention, is that of the refuse matter discharged into the river from the gas-works. Patches of such matter are encountered by the fishermen in bringing their cargoes of living fish into port, which not unfrequently kills off the entire stock in their wells, or otherwise imparts so strong a flavour of gas-tar to the fish as to render it unfit for consumption. This, although not usually realised until it arrives at the table of the consumer, is far-reaching in its effects, since a large portion of the finest fish being exported to Sydney and Melbourne, its reception there in a tainted state must tend to lower the repute of this Colony for the production of first-class fish.

2. Cucumber Mullet or Grayling.

During the past autumn steps were taken, under my direction, to secure a large quantity of the ova of the so-called Cucumber Mullet, Fresh-water Herring or Grayling (*Prototroctes marena*), for the purpose of re-stocking the Derwent and other of the southern rivers with this species. In the month of March as many as eight million ova were obtained and artificially fertilised from the fish caught in the Mersey near Latrobe, and thence conveyed south and placed in suitable stations in the Derwent close to the Falls above New Norfolk, where, many years since, the fish were in the habit of spawning. It may be anticipated that the repetition of these operations for a few consecutive years will have the desired result of once more establishing this much esteemed fish in its former abundance in this and other rivers that it is proposed to restock. The ova of this fish are to be obtained in almost unlimited quantities from the Mersey District, and I proposed to erect there, against the forthcoming

spawning season, a set of temporary hatching troughs for the reception of the ova until they have attained to the eyed condition, and when they are better able to endure the risk of transport. The height of the season for taking this fish with rod or line is coincident with that in which the spawn is fully matured, and there would be no difficulty in making arrangements with the local anglers to allow the ripe fish taken by them to be stripped of their ova and milt for the purposes of propagation in the manner indicated. Cordial co-operation in this direction has been already received from the residents generally of Latrobe, and similar or more substantial aid, if desired, is promised by them in the conduct of future operations. The assistance rendered by Mr. W. Harrison, of Launceston, in artificially fertilising, packing, and remitting a large portion of the Grayling ova placed in the Derwent, may be suitably acknowledged in this Report.

3. *Freshwater Lobster and Blackfish.*

In a previous Report, 1884, I advocated the desirability of directing attention to the artificial culture of the so-called Freshwater Lobster or Crayfish (*Astacopsis Franklinii*). This crustacean, which is confined to the northern rivers of Tasmania, and in many of these is rapidly becoming exterminated, represents the finest freshwater species yet discovered. It attains to a weight of 8 or 10 lbs. or more, is excellent eating, and could be so cultivated, on the system adopted in Europe with reference to the relatively diminutive form, *Astacus fluviatilis*, as to constitute an important and profitable industry. Having during the past year, through the kind courtesy of the Hon. Wm. Moore, M.L.C., had an opportunity of testing the flavour of this crustacea, and of obtaining an opinion from other connoisseurs, it was unanimously declared to be much more tender and more delicate in flavour than the indigenous saltwater Crawfish, *Palinurus*, and to much more nearly resemble in this respect the European Lobster *Homarus vulgaris*. A prejudice which prevails with many people against the consumption of this crustacean has probably arisen from their having partaken of it out of season, soon after the casting of their shell, when the flesh is poor and watery; or when the mistake has been made of mixing the liver with the flesh, as is done with the crab and lobster when serving it at table. The liver in this freshwater type has a bitter earthy flavour, quite unlike that of the liver which constitutes the so-called "cream" in the marine species, and an admixture of it with the meat spoils the flavour of the entire dish. In illustration of the substantial qualities of this crustacean as a food species, it may be mentioned that from an example weighing 4 lbs. precisely 2 lbs. of solid meat were extracted. Of this, 1 lb. was contained in the large claws or chelæ, and the remainder in the tail and other regions of the body. This species might be profitably cultivated by anyone having ground traversed by running water, and it may be favourably recommended for acclimatisation and artificial culture in European countries, to which it might be easily transported in suitable tanks placed on board the ocean steamers.

Not having facilities for the conduct of practical operations in connection with the culture of freshwater fish on a sufficiently extensive scale at Battery Point, the town water supply also not being suitable for such purposes, application was made by me last Summer for the use for such purpose of one of the ponds, and also of certain of the hatching troughs, not then occupied, at the Salmon Breeding Establishment on the River Plenty. It was also proposed in the space applied for to devote attention to the artificial culture and propagation of the Northern Blackfish (*Gudopsis marmoratus*), which might be profitably introduced into the Derwent and other Southern rivers, as also to place in the hatching troughs the greater portion of the ova of the Cucumber Mullet or Herring (*Prototroctes marena*), taken from the Mersey, and to develop the fry therein for future liberation in the Derwent. While the Salmon Commissioners did not see their way to granting the request made on this occasion, it is to be hoped that the facilities applied for may be conceded at some future time, there being abundant space on the premises at the River Plenty for the construction, if required, of additional ponds and hatcheries. The only, and necessarily expensive alternative to the proposition suggested, and which I should much regret to have to recommend, would be the establishment of a second station, with an accompanying staff, for the culture and propagation of indigenous freshwater fish.

Trusting that the operations conducted in connection with my Department during the past twelvemonth, and likewise the suggestions herein made for the future development of the fisheries of this Colony, may meet with your approbation,

I have the honor to remain,

Sir,

Your very obedient Servant,

W. SAVILLE-KENT, *F.L.S., F.Z.S.*,
Superintendent and Inspector of Fisheries.
Fisheries Department, August 12, 1886.

The Hon. the Chief Secretary.