1931.

NEW ZEALAND.

MARINE DEPARTMENT.

ANNUAL REPORT FOR 1930–31.

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

YOUR EXCELLENCY,— Marine Department, Wellington, 29th October, 1931.

I do myself the honour to transmit for Your Excellency's information the report of the Marine Department of the Dominion for the financial year ended the 31st March, last.

I have, &c.,
J. G. COBBE,
Minister of Marine.

His Excellency the Governor-General of the Dominion of New Zealand.

REPORT.

THE SECRETARY, MARINE DEPARTMENT, to the Hon. the MINISTER OF MARINE.

SIR,— Marine Department, Wellington, 20th October, 1931.

I have the honour to submit the annual report on the operations of the Marine Department for the financial year ended 31st March, 1931.

FINANCIAL.

The following statement summarizes the revenue and the expenditure of the Department for the past four years in comparison with the figures for 1922–23 :—

Branch.	1922–23.	1927–28.	1928–29.	1929–30.	1930–31.
		Revenue.			
Shipping Branch—	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Light dues	39,688 16 8	81,247 11 8	80,979 13 11	82,710 19 6	84,062 0 5
Engagement and discharge fees	3,179 11 0	2,790 2 6	2,583 2 9	2,614 3 0	2,235 3 6
Survey fees	3,095 9 0	5,144 7 6	5,123 8 6	5,037 12 6	4,184 18 11
Examination fees, &c. ..	395 12 6	321 5 0	268 8 0	296 5 0	367 1 0
Miscellaneous	1,289 0 4	427 5 11	1,745 9 4	2,236 4 2	1,736 15 1
Harbours—					
Pilotage, port charges, &c.	764 14 6	1,801 18 10	1,998 18 5	2,206 1 4	1,431 17 4
Foreshore revenue ..	1,126 14 1	6,212 2 3	5,582 0 5	4,817 17 9	4,559 17 3
Inspection of Machinery—					
Inspection fees, &c. ..	17,126 19 6	19,549 16 9	19,922 9 4	20,790 14 9	22,535 16 4
Examination fees, &c. ..	667 0 0	497 5 0	402 5 0	369 7 0	384 17 6
Fisheries—					
Net profit from sale of oysters	2,546 9 6	1,003 17 11	1,160 0 11	1,850 3 4	1,392 6 3
Fishing-boat license fees, &c.	324 9 6	845 0 1	542 0 6	668 3 8	638 15 10
Rental of toheroa-beds ..	10 0 0	300 0 0	300 0 0	300 0 0	300 0 0
Government steamers—					
Freight, passage-money, &c.	1,785 0 7	1,458 9 2	4,046 7 3	1,733 2 6	1,213 3 9
Ross Sea revenue	..	7,176 15 0	13,961 17 6	7,871 5 0	2 10 0
Miscellaneous revenue ..	2,800 11 4	1,616 3 7	41 6 4	15 11 4	14 8 10
Totals	74,800 8 6	130,392 1 2	138,657 8 2	133,517 10 10	125,059 12 0
		Expenditure.			
Head Office	9,612 2 8	9,721 15 2	9,397 4 4	9,273 9 10	9,708 14 1
Harbours	4,826 13 2	7,790 0 0	4,059 18 4	3,846 14 8	3,225 6 7
Lighthouses	27,834 14 8	24,266 9 2	23,919 13 11	26,793 14 5	23,691 3 4
Mercantile marine	15,150 17 11	24,792 14 9	25,266 9 2	27,142 19 10	27,373 3 1
Inspection of Machinery ..	27,015 0 0	21,842 2 1	21,573 2 7	21,957 5 10	24,652 11 7
Fisheries	4,545 3 2	3,389 19 10	3,281 12 10	3,727 1 2	3,147 16 11
Government steamers ..	21,697 19 6	20,733 16 9	21,559 12 3	20,820 19 5	21,257 3 11
Miscellaneous services ..	2,655 3 8	2,161 11 7	2,146 4 0	361 19 4	130 10 8
Grants and subsidies ..	1,510 0 0	594 0 0	260 0 0	1,350 0 0	175 0 0
Depreciation	8,035 4 9	9,158 5 10	9,662 2 8	9,748 17 5	9,806 11 5
Interest on Capital ..	15,716 7 3	18,119 18 0	17,285 17 5	17,434 15 2	18,256 11 2
Totals	138,599 6 9	142,570 13 2	138,411 17 6	142,457 17 1	141,424 12 9

An analysis of these figures shows that the operations of the Department result in a surplus after providing for depreciation, but before charging interest on capital.

Summarized, the results of the past ten years are as follows :—

Year.	Before paying Interest on Capital.				After paying Interest on Capital.			
		£	s.	d.		£	s.	d.
1921–22	Deficiency	74,146	4	2	Deficiency	95,153	14	11
1922–23	,,	48,082	11	0	,,	63,798	18	3
1923–24	,,	9,759	8	1	,,	27,231	4	9
1924–25	,,	2,144	4	11	,,	19,882	0	6
1925–26	Surplus	517	2	2	,,	17,294	8	10
1926–27	,,	5,881	5	2	,,	12,124	0	10
1927–28	,,	5,941	6	0	,,	12,178	12	0
1928–29	,,	17,531	8	1	Surplus	1,474	15	2
1929–30	,,	8,494	8	11	Deficiency	8,940	6	3
1930–31	,,	1,891	10	5	,,	16,365	0	9

From this it will be seen that the Department's financial position has improved considerably since the commercial balance-sheet system came into operation, although during the past few years the deficit has increased, owing principally to the loss of revenue from whaling operations in the Ross Dependency. In 1921–22 the deficiency was £95,153 14s. 11d., while during 1930–31 this figure was reduced to £16,365 0s. 9d., a net betterment of £78,788 14s. 2d.

No revenue was received in connection with whaling operations in the Ross Dependency during the year under review, whereas in the previous year £7,871 5s. was received. The general position with regard to whaling is explained fully in another part of the report.

Harbour Boards' Legislation.

Bay of Islands Harbour Amendment Act.—This Act empowers the Harbour Board to levy its rates on the capital values of all rateable property within the harbour district up to the 31st March, 1932, without a poll of ratepayers, and thereafter on that basis only with the consent of the ratepayers obtained by a poll to be taken.

It further provides for the harbour district to be a district within the meaning of the Rating Act, with a proviso that if the system of rating on the unimproved values is reverted to by the poll mentioned above, no other rates than those levied by the Harbour Board shall be affected.

Napier Harbour Board Loans Enabling Act.—This Act makes the following provisions :—

(*a*) It empowers the Board to reborrow any money required to meet any loans falling due and not provided for in the accumulated sinking funds for such loan ; such reborrowing to be subject to the provisions of the Local Government Loans Act, 1926.

(*b*) It makes provisions as to the security for such sums reborrowed for the requisite sinking fund and period of the loan, and for the protection of lenders.

Harbour Boards' Finance.

Harbour Boards, in common with most other concerns, have all suffered to some extent, and some of them to a serious extent, in their finances through the depression. Apart from the Boards of the four main ports, who have no rating-powers, comparatively few are able to carry on out of their ordinary revenues without recourse to some measure of rating on land, and others, which have not previously done so, may sooner or later have to take that step, unless there is a considerable revival in general prosperity, and with it a revival in the shipping trade. Some Boards are fortunate in the possession of more or less valuable endowments, but most are dependent on revenues derived from the various kinds of dues charged on ships and goods. In prosperous times these dues may be increased to make good deficiencies, but in the existing conditions it may be impracticable to do so, for it would have the effect of diverting the goods to another avenue of transport where such is available.

Not a few Harbour Boards are very heavily capitalized in relation to their present trade, some of them overcapitalized ; but despite falling revenues through the general depression in particular, and the increasing use of road and rail transport, the overhead charges are still there and have to be met.

A harbour is an asset to its district only so long as it can pay its way on the basis of charges on users which do not impose an economic bar. If or when that position arises the asset has no convertible value for other purposes, but the debt remains. It is for this reason that the Department has done what it can during the past few years to defeat harbour construction or extension proposals, which it considered unsound from the economic or any other point of view. It has not always been directly successful, but, as a result of its successful opposition to one scheme estimated to cost £200,000, the harbour authority has been able to effect the really necessary works out of its own funds, and, in addition, to reduce its rate on land by 50 per cent. and at a time when such relief was most essential.

As an indication of the falling-off in the shipping trade it may be mentioned that the Department's revenue from light dues in six months of this year as compared with last year has fallen by 12½ per cent. But the falling-off in shipping trade may quite readily be considerably greater than this, because the dues are based on the net tonnage of the ship and irrespective of whether the ship is fully or only partially laden.

Some remarks of mine in the 1924 annual report (H.–15, pp. 3 and 4), urging that harbour construction and extension proposals should be subjected to critical investigation in order to ascertain whether the work proposed to be undertaken was (*a*) really necessary, (*b*) adequate and/or alternative transport facilities did not already exist, (*c*) the expenditure was justified as a self-supporting harbour-work proposition, were severely criticized in certain quarters to which the remarks were applicable, the generalized accusation being that the Department was working for centralization of overseas shipping on the main ports. The writer was then entirely unaware of the existence of any such policy, but was merely concerned in the competition which was even then developing between road, rail, and sea transport, and which has since become intensified to an extent not then realized. The following is an extract from the 1924 report :—

> "Our transport ways for goods and passengers are threefold—by road, by railway, and by sea. To meet the cost of construction and maintenance of the first, and the cost of construction, maintenance, and operation of the second, the general public must of necessity pay, since they are publicly-owned utilities, and any loss must be made good by increased charges or indirect taxation. Internal communication by these means is an essential. Harbours are also essential, in the first degree, for export from New Zealand of our products and receipt of goods from overseas. They are equally necessary for dealing with transport between islands, and between places where no other adequate or sufficiently economical means of transport exists. But they cease to justify essential category when constructed to provide for traffic which can be adequately provided for otherwise by publicly-owned utilities (road or railway), and at a capital-plus-operating cost which cannot be met by charges on shipping and goods, but which requires the deficit to be made good by special taxation over the district. Interests particularly served by competitive transport ways quite naturally do not concern themselves with the loss accruing to the community, while the community, by reason of apathy or lack of understanding of the net result, or lack of opportunity to govern the matter, fails to assert itself; but it has to pay in any event."

It is suggested that the truth of this contention in 1924 has now become obvious.

Harbour-works.

Westport Harbour Entrance and Bar.—In order to improve harbour conditions it was decided to undertake breakwater extension, and this has had a good effect so far as it has gone. The work which the Department can do is entirely dependent on revenues from the port and its endowments. Unfortunately, the serious falling-off in the coal trade and consequential fall in revenues necessitated stoppage of this work.

Karamea Harbour.—During the year the shoaling in the fairway has been accentuated. An enormous quantity of sand, silt, and general detritus has been brought down to the lower reaches by successive floods in the Karamea River, and a very considerable deposition has occurred in the slacker waters through the coastal plain.

The last investigation of the upper reaches of the river in January confirmed the extensive rending and disturbance of the hills and mountains by the earthquake in nearly all parts of the watershed, and revealed the fact that only a comparatively small quantity of the disintegrated rock material had reached the tidal area.

The transportation of detritus, associated with deposition in the lower reaches and harbour area, can therefore be confidently assumed for many years to come, and, under these circumstances, any marked immediate improvement in the harbour entrance and fairway with works in hand or proposed can hardly be anticipated, though the influence of such works, in relation to the river-flow, is an important factor.

At the beginning of the period under review it was possible to work the port only at spring tides and with favourable sea conditions. A slight improvement to the channel at the wharf occurred in October, but further floods practically closed the port to shipping as from November, 1930.

The last serious floods which occurred at Easter (3rd April, 1931), caused further extensive deposition, and the formation of shoals between the Otumahana and the training-wall, and resulted in a considerably increased flow (approximately 70 per cent. of the river) down the Otumahana Channel. Steps were immediately taken with regard to a proposal for improving the flow over the Karamea bar by blocking the entrance to the Otumahana, with a half-tide pile-and-netting wall. This work, to influence and regulate the Karamea River flow, is now in hand.

Work carried out during the year to reduce the Otumahana overflow with a blockage of logs and cable was effective up to the time of the Easter flood.

Training-wall.—During the year the work of replacing the old timber-pile wall by quarried stone has been expeditiously carried out—11,803 tons of stone having been placed during the year. Further temporary strengthening and retopping of the old wall was necessary for stone-tipping purposes. The whole length of the wall—17½ chains— has been completed to half-tide level, while at the extreme outer end a length of 5 chains has been built as a full-tide wall. At a point near the approach bank of the training-wall 300 tons of ballast was tipped for use in extending the stopbank round the adjacent length of Simpson's Island to prevent flooding of the tram-line during spring tides.

Oparara Quarry.—At the beginning of the year a new quarry was being opened up. This has developed very satisfactorily and produced excellent stone. Various tunnels for quarrying the rock have been driven and fired with good results. During Christmas and New Year holidays the quarry plant and rolling-stock were thoroughly overhauled. At Rhinds erosion-protective works, adjacent to and associated with the quarry, 833 tons of box stone and spoil have been placed.

Survey.—A comprehensive survey has been made to definitely establish relative information concerning the harbour and adjacent areas for future reference, and for the consideration of various proposals at present under review.

Little Wanganui Harbour.—Since the closing of the Karamea Harbour the Little Wanganui Harbour has been worked on an average of once a week. The "Kotiti" can reach the wharf at high tide at all times, while the "Fairburn" arranges her itinerary so as to call at spring tides. Towards the end of the year a sandspit commenced to encroach on the upstream end of the wharf and threatened to interfere with the berthage. This was partly due to the influence of a huge earthquake slip a short distance up the river. Proposals have been approved for the erection of a piled permeable groyne to regulate the channel-flow so as to give the desired berthage improvement.

Waikokopu Harbour.—During the year work has been continued on the breakwater, except during the period when the contract was under revision. About 9,000 tons of stone were deposited in place, and even though the wall is yet unfinished the benefit to the wharf is very apparent, the shelter being very much improved. This locality is subject to very sudden storms, and as an indication of this it may be mentioned that the breakwater-staging was wrecked by storms twice during the year. It is anticipated that this work will be completed in about six months' time. A transmission-line has been put in, and the wharf-lighting connected up with the Power Board's electric mains. The wharf and wharf facilities have been well maintained, and the trade has been very constant throughout the year.

Taiaroa Wharf.—A new wharf was erected at the end of the existing jetty in place of the old wharf, which had collapsed. The new wharf has a kauri superstructure on turpentine piles.

Matiotitawa Wharf.—The approaches to this wharf were completed during the year.

Naumai Wharf.—The approach to this wharf was also completed during the year.

Tikinui Wharf.—Plans were prepared for the construction of a new wharf 118 ft. long with approaches, and the work has been put in hand.

Tinopai Wharf.—This wharf has been completed, together with approaches.

General.—A large number of applications have been received from Harbour Boards, local bodies, and private individuals for the approval of works involving Marine interests.

Lighthouses.

North Cape Lighthouse.—A new flashing apparatus has been installed in the original lens to take the place of the original flasher, which had not been wholly satisfactory.

Matakoa.—This light has been equipped with a new automatic acetylene flashing apparatus.

East Head.—A site has been selected for this light on East Head, Akaroa Peninsula, and the necessary flashing apparatus lens, and lantern, have been ordered. This light, being located on the main salient point of the peninsula, should be of great assistance to coastal traffic both from north and south. It is proposed to call this "Le Bon Light" after the Bay of the same name, which is adjacent. This will avoid any confusion with the existing East Cape Lighthouse in the North Island.

Portland Island.—A radio-telegraph set has been established at this station, which should considerably relieve the isolation, and enable the keepers to be in constant communication with the mainland in case of emergency.

Baring Head.—An area of land has been acquired for the new light in this locality, which will take the place of the existing high-level light at Pencarrow. A contract is being let for the construction of the access road, and it is expected that contracts for the erection of cottages, fog-signal house, tower, &c., will be proceeded with almost immediately. The apparatus will be of a powerful flashing type. The new light erected by the Harbour Board at the entrance will then take the place of the old Pencarrow Head Lighthouse which has been in operation for over seventy years. The advantage of the new location of the light and fog signal lies particularly in the fact that these navigation aids will be outside the danger instead of inside. Furthermore, Cape Palliser, Baring Head, the Harbour Board light at Pencarrow, and Karori Rock lights will be interlocked in sectoring in such a way as to make safe navigation in conditions of bad visibility very much more certain. It is probable that later on a radio-direction-finding beacon will also be established at Baring Head, but this depends on the extent to which ships fit the complementary equipment.

Godley Head.—The necessary apparatus for converting this light from a fixed oil-burner to a flashing type has been ordered, and the conversion should be completed early in the coming summer. Although this light is still thoroughly efficient, the universal use of powerful public and domestic electric lights render the fixed character unsuitable, and it is for this reason that the change is being made.

Taiaroa Heads.—A new powerful fog-signal constructed on the diaphone principle and similar to those already installed at Pencarrow and Godley Head was installed. It is housed in a reinforced concrete building, and is a great improvement on the old explosive signal.

Kahurangi.—A new 800 mm. lens has been installed in this lighthouse to take the place of the old lens, which was irretrievably damaged by the earthquake, and new cast-iron segments have been erected, some of the original segments having been badly cracked. The light itself is operated automatically, the illuminating apparatus consisting of a Dalen burner using acetylene gas.

New Lighthouse Tender "Matai."

This vessel was delivered by the contractors, Messrs. R. and W. Hawthorne, Leslie, and Co., Ltd., on the 12th October, 1930. The vessel was put into immediate commission and has functioned perfectly—a credit alike to designer and builder. The echo-sounding apparatus, which was a subcontract, has, however, failed so far to operate reliably. An expert sent out by the subcontractors is now endeavouring to ascertain the cause, and, if possible, to remedy the trouble.

Adjustment and Inspection of Ships' Compasses.

During the year 179 compass-adjustments were investigated. The work performed by the licensed Adjusters of Compasses at the various ports has been examined by the Inspectors of Compasses, with the result that a fairly high standard of efficiency has been maintained.

Shipping Casualties.

An appendix to this report shows the number of shipping casualties reported to the Department. It is to be understood that this includes every minor kind of casualty, and does not in any way mean that because sixty casualties were reported that there were sixty occasions when life was endangered on account of the casualty.

Going back to 1924 when the "Ripple" was lost, there have been only three cases up to March, 1931, where loss of life at sea has occurred from casualty to a ship under the Department's survey, as follows:—

S.s. "Ripple," 7th August, 1924: eighteen lives lost.
S.s. "Karu," 28th February, 1926: Two lives lost. These men tried to swim ashore. Others saved by staying with ship.
Auxiliary ketch "Isabella de Fraine," 14th July, 1928: Eight lives lost. Vessel capsized on Hokianga Bar.

Thus in seven years the total loss of life arising from casualty to ships under Department's survey amounts to twenty-eight, or an average of four per annum. It is true that there have been other casualties resulting in loss of life, but these are practically confined to fishing-launches not under the Department's survey, and which has therefore no control over them. No doubt a proportion of these vessels, by reason of faulty design or lack of proper maintenance, are quite unsuitable for the work they undertake, but the fishermen generally will do anything in the way of tonnage-reduction in order to escape survey.

"Notices to Mariners" and Navigational Warnings.

Information relative to changes in navigational aids on our coasts and elsewhere, and to the discovery of obstructions, wreckage, &c., or other dangers to navigation, is published in the form of Notices to Mariners, of which fifty-five were issued during the year and distributed locally and to countries which reciprocate in such matters.

Admiralty Charts.

The Admiralty charts stocked by the Department are being increased annually as the demand necessitates. Many hydrographic corrections necessary to the charts occur from time to time, and these corrections are made here so as to ensure that purchasers receive the most up-to-date charts available. The importance of mariners procuring up-to-date charts cannot be too strongly urged, as the value of a chart used for navigation depends upon its accuracy and the inclusion thereon of the corrections to which the chart has been subjected to subsequent to the survey on which the chart is based.

Examination of Masters and Mates.

Considerable changes in the conduct and syllabus of examinations were made by the Imperial Board of Trade on 1st January, 1931, and were brought into force here on the same date in accordance with our usual practice. The majority of the changes embody the recommendations made by a committee which was appointed by the Board of Trade to consider the system of examination then existing.

The new examinations exact from candidates a wider knowledge of their profession and a greater use of their reasoning powers than was formerly the case; and, with few exceptions, the work is eminently practical. The navigation problems are practically modelled in the everyday practice of navigation, and candidates are allowed to solve them by the methods they have been accustomed to use, provided the principles are correct.

The candidates are now allowed to bring their own instruments and slide rules if the approval of the Examiner is obtained before the commencement of the examination. The age of candidates and the sea-service requirements have been increased, but no hardship should result owing to the provision of special clauses in the regulations.

The examination is now divided into three parts—signalling, written, and oral. The signalling part may be passed six months before or after the main examination, but the written and oral parts must be taken together the first time or after a complete failure. If, however, a pass is gained in either the written or oral parts, a partial pass which holds good for six months is granted.

The examinations, as usual, have been held in Auckland, Wellington, and Lyttelton. The total number of examinations held during the year was eighty-eight, of which seventeen were for signalling only. The percentage of passes this year was 46·5, a rate which is slightly below the average for the previous ten years.

Examination in Form and Colour Vision.

Fifty-three sight-test examinations were held in the four main ports; 34 per cent. of them being held at Auckland, 32 per cent. at Wellington, 15 per cent. at Lyttelton, and 19 per cent. at Dunedin. Six special examinations were held, at which only one candidate succeeded in passing.

Publication of "New Zealand Nautical Almanac and Tide-tables."

The "New Zealand Nautical Almanac and Tide-tables" for the year 1931 (twenty-ninth edition) was issued in November last, so as to enable its contents to be available in ample time before the end of 1930 to ships proceeding beyond New Zealand.

The "New Zealand Pilot."

The ninth edition, 1919, of this publication has been under revision for some time and it is hoped to despatch the last signature to the Hydrographer at an early date. This publication, for the year 1931, thirtieth edition, was issued on the 1st November, in accordance with the general desire of shipping companies for their vessels to have the use of it should they be away from the country at the beginning of the year.

Survey of Ships.

The following table shows the number of certificates of survey issued to ships during the year, the figures for the previous year being shown in parentheses:—

Class.	Number.	
Seagoing steamships and auxiliary-powered vessels	186	(202)
Seagoing sailing-vessels	12	(13)
Restricted-limits steamships and auxiliary-powered vessels	442	(499)
Total	640	(714)

The slackness of trade during the present depression is reflected in the reduced number of vessels surveyed for certificates. Of the total number of vessels five sea-going and sixteen restricted-limits vessels were surveyed for the first time. The seagoing vessels are s.s. "Wainui," m.v. "Port Waikato," m.v. "Waka," m.v. "Taupata," and the cable vessel "Iris." The motor-vessels "Waka" and "Taupata" are new vessels built of wood at the yard of Mr. George Nicol, Auckland, and are engaged in the coastal trade. Both have twin screws and are propelled by Diesel engines. The "Waka" has a length of 112 ft. 2 in., and her tonnage is 236 gross and 117 register, and "Taupata" has a length of 117 ft. 8 in. with tonnage 268 gross and 143 register. They are very handy cargo vessels, and are reported to be giving good service. The "Port Waikato" is a new vessel built of steel at Leith in 1929. She is propelled by one set of Diesel engines and has a length of 180 ft., and a tonnage of 668 gross and 342 register. The H.M. cableship "Iris" was transferred to private owners during the year, and consequently surveyed and registered under the Merchant Shipping Act.

The sailing-vessel "Talisman" was converted to an oil-engine vessel. The numbers of sailing-vessels engaged in New Zealand trade are rapidly diminishing, only twelve being surveyed for certificates during the year as against fifty-five ten years ago. An interesting feature of the year's returns is the number of conversions from steam to oil-engines among the small vessels of the coasting fleet. The development of the type of heavy-oil engine suitable for small vessels has been considerable during the last few years. The old type, commonly known as "semi-diesel," and requiring preheating of the combustion chamber of the cylinders by a blow lamp or electrical device has been replaced by a type known as "cold-starting." This type has been fitted in all the vessels converted during the year—viz., in the "Awahou," "Pukeko," "Kapuni," "Kapiti," "Hawera," and "Alexander."

Two hundred and twenty-five vessels were surveyed for sea-worthiness and efficiency under section 226 of the Shipping and Seamen Act. There were also twenty other surveys made, making a total of 245 surveys carried out in addition to the usual periodical surveys, as against a total number of 300 additional surveys in the previous year.

Board of Trade and departmental circulars relating to survey of Diesel engines, fires in coal-bunkers and cargoes, anchors and chain cables, steel for shafting, spare gear for motor-vessels, approved fire-extinguishers, and distress signals were issued during the year.

New Zealand shipping law requires that every trading-ship, whether passenger or cargo carrying, shall be submitted for survey by the Department every year. Having regard to the practice in, say, Great Britain, which does not require cargo-ships to be annually surveyed at all, except in respect of their life-saving equipment and navigation equipment (and that only as opportunity offers), and in the Commonwealth of Australia, which does not require annual survey of cargo-ships (other than life-saving equipment) unless they are not under the survey of an insurance corporation, which is a four-yearly survey, shipowners in New Zealand have long regarded our annual survey as a disability on their operations not imposed on the shipping of other countries. The existing depression in shipping trade has caused them to seek some relief. The whole matter has been threshed out in conference between departmental officers and a committee appointed by the Shipowners' Federation. The Department felt that the principle of annual survey, which has been so long in operation, is one that should definitely be maintained, and in the Regulations and Instructions to Surveyors recently issued this has been done. The Act, while requiring annual survey, does not prescribe what parts of the ship have to be opened up annually for the Surveyor, and, therefore, does not prescribe the measure of survey. In actual practice the survey has not been altogether satisfactory to the Department, because so much is left to the opinion and discretion of the individual Surveyor. Under such

a system there will often arise difference of opinion as between Surveyor and owner, and, also, even, what one Surveyor will pass another Surveyor will not pass, the difference between them being merely matters of opinion. There was, also, the weakness that while there might be reasonable doubt whether repairs were necessary for so short a period, there would be no doubt in respect of a longer period.

After a thorough investigation, it became evident that a new system of survey could be devised under which the result would be more satisfactory to the Department, and less burdensome to owners. Under the Regulations and Instructions to Surveyors a ship may remain under the system in operation prior to new regulations, for the first four years, but eventually all ships must come under the new system. Under the latter, the survey will be carried out by a departmental Surveyor in conjunction with the insurance corporation surveyor, if the vessel is classed with such a corporation. The survey will be an intensive one, embracing every part of the ship, enabling a complete establishment of her conditions, and specifications of reconditioning required for classification. This will form the basis for further four-yearly surveys in which the Department and the insurance corporation surveyors act in conjunction. So far as the Department is concerned, there will be annual or biennial surveys, as the case may be, of certain parts of the ship, so as to maintain a regular watch on those parts of the ship which may possibly get out of condition within the four-yearly period. Apart from the fact that the regulations require that *every part* of the ship shall be seen and examined and tested where necessary every four years, the instructions inform Surveyors definitely just what examination is to be made at each interim survey, and, what is most important, completely instruct them as to standards of allowable deterioration. Thus, both Surveyor and shipowner will know exactly where they stand and there will be no room for differences of opinion between them, or difference of opinion among the Surveyors at the different ports at which a ship may come up for survey. But, notwithstanding the prescription of detail and periods of main and interim surveys, if the Surveyor should find or hear, at any time, that any part of the ship is not as it should be, he will have full authority to investigate and take such action as may be necessary to ensure safety.

The Chief Surveyor and myself are convinced that the new survey system will be more satisfactory and dependable than the old.

Safety Cargo-working Hook.

Arising out of representations made by the National Disputes Committee appointed by the Shipowners' and Waterside Workers' Federation, the Department, in continuance of its endeavour to make cargo-working more safe, instituted a competition for the production of a safety cargo-working hook. Over one hundred and seventy specimen hooks were received in due time, and, despite that the competition had closed, a considerable number have since been sent in for the Department's consideration in the event of the competition failing to produce a satisfactory hook. These latter hooks cannot, of course, be considered in connection with the competition.

The conditions of the competition indicated that the design of the hook should be, as far as possible, such that—

(1) The sling will not become detached when the hook is in a resting position :
(2) The sling will not come off the hook should the hook turn upside down through the yard-arm wire fouling and midship wire :
(3) The hook will not foul the coamings or obstruction :
(4) The hands of workers are not liable to be injured when the sling is attached to or detached from the hook :
(5) The hook is practically fool-proof :
(6) The hook is convenient to use.

An Advisory Committee was set up consisting of four representatives each of the Waterside Workers' Federation and Shipowners' Federation, and two representatives of the Department. Seven hooks were selected by the committee for trial under actual working-conditions on various ships and at various ports. Five of these hooks were of the type where what would ordinarily be a gap in the hook is barred by some mechanical contrivance. The other two hooks had no mechanism, but relied for safety on design.

As the competition is not yet disposed of by the Advisory Committee it would not be appropriate to make further comment on hooks submitted. The Department regrets that the matter is taking so long to finalize, but has not been able to avoid the delay.

Registration of Shipping.

On the 31st December, 1930, there were on the register of vessels in the Dominion 65 sailing vessels, of 5,892 tons register ; 242 steamers, of 98,305 tons register ; and 224 motor-vessels, of 7773 tons register, as compared with 71 sailing-vessels, of 8,868 tons register ; 253 steamers, of 104,407 tons register ; and 217 motor-vessels, of 6,242 tons register, at the end of the previous year.

The number of seamen and boys employed on board was 3,680, as compared with 3,805 for the year 1929.

Government Shipping Offices.

In the Government shipping offices the administration of the Shipping and Seamen Act has been efficiently carried out. Appended is a statement showing the number of seamen engaged and discharged at the various ports during the year, and the fees received for such transactions. The total

number engaged and discharged was 12,235 and 12,697 respectively, as against 14,568 and 14,460 respectively, during the previous financial year. The transactions at the four main ports were as follows (the figures in parentheses being those of the previous year):—

Port.	Engagements.	Discharges.	Fees.	
			£ s. d.	£ s. d.
Auckland	3,606 (4,405)	3,860 (4,498)	692 5 0	(815 6 0)
Wellington	5,200 (5,860)	5,156 (5,650)	913 14 0	(1,022 8 0)
Lyttelton	979 (1,163)	979 (1,135)	164 3 0	(198 10 0)
Dunedin	1,015 (916)	1,121 (1,010)	190 3 0	(181 6 0)

Inspection of Seamen.

This service has been maintained. A record of seamen applying for work is kept for the purpose of filling vacancies as they occur.

Sick and Injured Seamen.

The total amount paid by shipowners to sick and injured seamen under the provisions of the Shipping and Seamen Act, 1908, and its amendments was £16,025 4s. 2d., as against £21,814 8s. 2d., a decrease of £5,789 4s.

Examination of Marine Engineers.

During the year 319 (214) candidates were examined for marine engineers' certificates of competency at the various examination centres throughout the Dominion.

Of the 190 (104) candidates who were examined for third-class certificates, and second- and first-class ordinary certificates of Imperial validity, for service in sea-going steamships, 65 (34) third-class, 12 (14) second-class, and 18 (17) first-class were successful; and 62 (15) third-class, 7 (5) second-class, and 26 (19) first-class candidates failed in the examinations.

The remainder of the candidates, 129 (110) in all, were examined for certificates of competency which are valid in New Zealand only. Of these, 73—55 of whom were successful—were examined for service in sea-going vessels propelled by some motive agent other than steam, 44—38 of whom were successful—for service in vessels propelled by some motive agent other than steam plying within restricted limits, and 12—8 of whom were successful—for service in steam-driven vessels plying within restricted limits.

The figures in parentheses indicate the attendance at the examinations held during the previous year.

Formerly examinations for all grades of Marine Engineers' certificates were held at fifteen centres throughout the Dominion, but since the coming into force of the revised regulations examinations for certificates which are valid in New Zealand only are held at all of these centres. Candidates for third-class certificates, and second- and first-class ordinary and motor certificates of Imperial validity may now be examined at the four principal centres only—viz., Auckland, Christchurch, Dunedin, and Wellington. Examinations for extra first-class certificates are held at Wellington only.

During the course of the year amended rules for the examination of marine engineers (steam) were brought into force. Provision was also made for the examination of motor-engineers and an examination to enable the holder of a steam certificate to obtain motor endorsement, enabling the holder to act in respect of both steam and motor engines. This has reference to certificates having Imperial validity—in effect, certificates which are accepted anywhere in the world. This recognition is obviously of great importance to certificated holders, and must be maintained. But in order to ensure its maintenance it is clear that we must maintain a standard of training, education, and examination equal to that of the Marine Department of the Board of Trade. Provision has also been made for the examination of candidates for the extra first-class certificates.

Complaints have been received that a certain number of candidates have been refused examination because their apprenticeship has not been served, or insufficiently served, on the various classes of work laid down by the Board of Trade as qualifying, whole time or part time. It has been contended that the candidate for his first examination has been adversely affected by the new rules. This is not the case, so far as the rules are concerned—in fact, the contrary is the case—for the rules have been eased, from the candidate's point of view, in two ways: Under the old rules, if a candidate at the expiry of his apprenticeship, found himself somewhat short of full qualifying time, he could not be examined. Under the new rules he may make up the shortage by working as an improver or journeyman on qualifying work. Again, under the old rules a candidate had to secure 66⅔ per cent. in every division of the examination. Under the new rules the pass percentage has been amended to require only an average of 60 per cent. in the total of all divisions—that is to say, if a candidate's marks are only 50 per cent. in one division the shortage may be balanced against a 75 per cent. pass in another division.

Coincident with the new rules, and still with the object of assuring Imperial recognition of our certificate, it became necessary, as it always has been from time to time, to check up the classification of the engineering shops and ascertain whether or not they were still entitled to the classification of full-time training-shops. This depends on the class of work which is being regularly performed. The result of this examination revealed in certain cases that the incidence of work and the quality of it had changed, and therefore the shop could no longer be regarded as full-time.

In so far, however, as the necessity of maintaining the Imperial validity of our certificates will permit, applications for examination from lads whose apprenticeship has been served in good faith in workshops which, previous to the recent reclassification were classed as fully qualifying for marine examination purposes, but which have subsequently been reduced in status, will receive the utmost consideration, each case being dealt with on its merits.

This is, to a limited extent, justifiable owing to the fact that our apprentices are legally required to serve five years as against four years in the United Kingdom, although, in fact, the Home apprenticeship usually covers a period of five years.

In proof of the need for the aforementioned reclassification, the cases of two lads—holders of the third-class certificate issued by this Department—whose apprenticeship was served in the Dominion, and who, after having performed the requisite sea service, presented themselves for examination for the second-class certificate in the United Kingdom, may be cited. On making application for examination, these candidates were informed by the Board of Trade Examiners that, as the workshop service which they had performed was not of the quality prescribed by the Board of Trade, they could not be examined there for that certificate. These cases clearly indicate that the discretionary powers which we may exercise in this connection are not unlimited.

The Department is now engaged in the preparation of rules for the examination for a certificate, first and second class, to be known as coastal motor, which, as its name implies, will be available for use only in home-trade motor-ships. Before a candidate can qualify to sit for examination for the unrestricted motor certificate he must have served in a motor-ship of not less than 373 b.h.p. for second-class certificate and 560 b.h.p. for first class. There are few such ships running in New Zealand waters, and, therefore, a minimum of opportunity to obtain the requisite sea service. If, therefore, this restricted certificate were not provided for, a considerable number of our own men would be denied the opportunity of entering into this employment. The prescription of a manning scale for these coastal motor-vessels is also under consideration.

Inspection of Boilers and Machinery.

Boilers and Pressure Vessels.

The following is a statement of the number of inspections made during the year, the corresponding figures for the previous year being shown in parentheses :—

	Number.
Boilers and steam-pressure vessels inspected for the first time ..	261 (286)
Air-receivers inspected for the first time	193 (293)
Total inspections of all boilers and pressure vessels	8,144 (7,925)

The air-receiver regulations have now been in force for a little over two years, and the majority of the receivers in the Dominion have been inspected.

Among designs of the new boilers submitted for the consideration of the Department there were several of low-pressure miniature boilers, a type now being developed for use on dairy-farms. The dairy-farm, in the early days of machine milking, was generally equipped with a steam plant. Firewood was plentiful; and, in addition to driving the milking machinery, the boiler supplied steam for the complete sterilization of cans and plant. As the farms became cleared and firewood scarce, the boiler was replaced by the oil-engine, to be replaced in its turn, in many districts where electric power became available, by the electric motor. Without the aid of steam the sterilization of his plant has always been a problem for the dairy-farmer, and to satisfy this want, the low-pressure miniature boiler has lately been developed. Six designs were submitted during the year, two of which, by an ingenious arrangement of a head of water, although open to the atmosphere, generate steam at slightly above atmospheric pressure. One type, described as an electric-heat storage generator, is made for use in districts where electric power is available. Power is used at periods of the day when a low rate for consumption can be obtained, and oil, contained within the boiler, is heated to a high temperature. When steam is required water is admitted to the generator, and, being rapidly heated by the oil, is available as steam in a few minutes. This apparatus is convenient to use and is stated to give very satisfactory results.

An amendment to the land-boiler rules made during the year limits the use of the lap seam in a shell or drum subject to tension stresses. The amended rule applies to new construction only. The lap seam may be used for boilers not exceeding 36 in. diameter and 100 lb. working-pressure. Where this diameter or working-pressure is exceeded the double-strapped butt joint must be used. The amended rule was determined from data compiled from records of all lap-seam failures known to have occurred in the Dominion. Of ten failures during recent years, nine boilers had a working-pressure over 100 lb. per square inch, and one boiler had a working-pressure of 100 lb., but the shell diameter was over 36 in. The compiled information of the Department's experience with lap seams was issued in circular form to all Inspectors of Machinery and, at the request of those interested in boiler-design, a few copies of the circular were distributed to leading boilermakers, boiler-owners, and surveyors to classification societies in the Dominion.

In June of last year a serious mishap occurred to a Lancashire boiler. The boiler was of the usual Lancashire type with double furnaces, and was one of a battery of three used for power-generation and general purposes in a large freezing-works. On an afternoon shift shortly after a change of watch-keepers the crowns of both furnaces collapsed. The plates were badly deformed, but the material proved of good quality and fortunately did not rip. The damage when examined by an Inspector of Machinery was found to be confined to the second, third, and fourth sections of each furnace, and gave every indication of having been caused by the overheating of the plates due to

shortness of water within the boiler, and an inquiry into the circumstances attending the accident proved this to be the case. The engineer who was responsible for the safe-working of the boilers did not examine the water-level for three and one-half hours before going off shifts, the duty of attending to the water-level being left to an uncertificated fireman engaged on firing the boilers. The relieving engineer who took over the watch shortly before the furnaces collapsed did not examine the boilers, and so failed to notice that the water-level in the damaged boiler was dangerously low. After the accident the feed check-valve was found shut, and had been closed for at least one and three-quarter hours before the furnaces collapsed. The accident was due to mismanagement on the part of those who were responsible for the safe-working of the plant, and illustrates the importance of the regulation of feed-water. This duty should always receive the attention of the person in effective charge, and never be left to an uncertificated fireman.

Machinery.

The total number of machinery inspections for the year was 48,186. Among these, 83 lifts and 22 cranes were inspected for the first time.

The following table shows the number of inspections of boilers and machinery from 1915–16 onwards :—

Year.	Number of Inspections.	Year.	Number of Inspections.
1915–16	17,857	1923–24	32,891
1916–17	19,362	1924–25	35,797
1917–18	21,118	1925–26	42,529
1918–19	22,614	1926–27	47,209
1919–20	25,824	1927–28	48,638
1920–21	28,553	1928–29	47,393
1921–22	31,876	1929–30	50,189
1922–23	33,124	1930–31	56,330

From this statement it will be seen that the number of inspections has practically doubled in the past ten years.

There were reported during the year 11 fatal and 67 non-fatal accidents. Three of the fatal accidents were not due to machinery causes in respect of which the Department had any responsibility. In the case of each accident the circumstances were closely investigated, and an Inspector of Machinery has made a detailed report. Where practicable, steps were taken to prevent a recurrence of similar accidents. As is usual with machinery accidents, indifference or ignorance on the part of workers of the potential dangers of moving machinery were the cause of the majority of the accidents. Among the fatal accidents two of the victims were, unfortunately, children of four years of age. In each case the accident occurred in milking-sheds. The children accompanied their parents to the sheds and played about the machinery during milking operations. Loose clothing becoming entangled with running shafts was the cause of the accident in each instance. In both these cases the unguarded machinery had not been examined by an officer of the Department, one plant being a new installation and the other had been rearranged since the last visit of inspection. Transmission machinery was responsible for four of the fatal accidents, two occurring with shafting and two with belts. Loose clothing was the primary cause of the accidents with the running shafts. The circumstances which occasion many transmission machinery accidents show that the dangers are not understood as they should be by both employers and operatives, and to indicate the principal sources of danger and the precautions to be taken when working near machinery a conspicuous danger notice has been recently distributed to factories and power plants in the Dominion. An unusual fatality occurred when an operator of a chaff-cutting machine fainted and fell across the machine. His hand was badly mangled necessitating amputation, but death, according to medical evidence, was due to natural causes. One lift fatality occurred during the year. A cot patient in a hospital, through the unexpected movement of a lift, was thrown to the floor and rolling into the lift well, was killed. The coincidence of a simultaneous breakdown of three safety devices used in this lift was the cause of the accident.

Of the 67 non-fatal accidents, 31 occurred at wood-working machinery, 14 of which were at circular saws. Among the remainder 5 were connected with power presses, 2 with lifts, and 2 with milking machines. In one case of an accident at a milking-machine plant a man had his right arm torn off at the shoulder. It is of interest to note the severe nature of the accident, as the electric motor driving the machinery was only 2 horse-power. The dangers of even the smallest power-driven machinery cannot be too often stressed.

Circulars dealing with guards for gear wheels and shafting, feed rollers of printing machines, circular saws (two), shaping-machines, and rolling-machines in confectionery works were issued during the year. Copies of nine safety pamphlets issued by the Imperial Home Office were distributed to all Inspectors of Machinery. These pamphlets have been adopted by the Department as a standard of safety for the fencing and guarding of machinery in New Zealand. The pamphlets cover a wide field, and in addition to illustrations of mechanical safety devices contain many suggestions and much information which should be helpful in the prevention of machinery accidents. A stock of the pamphlets is carried by the Department and any machinery owner or worker interested in the guarding of machinery can obtain copies on application to the head office at a very moderate price.

For some years past there has been more or less agitation against the annual inspection of farm machinery. The grounds of objection have been various : That it is unnecessary, that it is a burdensome or irritating tax, or that the expenditure on salary and travelling-expenses of the Inspectors is a waste of public money. During the more recent times of depression the protest has become more vigorous and widespread.

This class of inspection certainly does not pay the cost involved and the more the Department does of it, the greater will be the ratio of loss. Fees could, of course, be increased to cover the cost, but that would merely increase the objection. It is difficult to know what is the real opinion of the great majority of those affected, because, as in all such matters, those who object do all the complaining, and those who are content take no action.

There is power under the Inspection of Machinery Act by which the Governor-General in Council may exempt any class of machinery from the provisions of the Act—that is to say, none of its provisions shall apply. It was considered undesirable to use this authority for the exemption of farm machinery, because, firstly, the inspection has so long been in force by the will of Parliament, and, secondly, because it would not be right to entirely disregard the necessity for guarding such machinery so as to protect life and limb as far as that is possible.

An amending Bill will therefore be introduced this session, which will exclude farm machinery not exceeding 5 horse-power from annual inspection, but will retain the powers of section 16 of the Act, imposing a legal obligation on the owner of any machinery to guard it and a penalty for not doing so. The amendment will further impose on machinery-dealers in general, agents, distributors, and erectors, a similar obligation to guard machinery before selling or when erecting it. Power will also be given to serve notice on dealer, agent, distributor, or owner, that certain machinery in so insufficiently guarded or fenced as to be dangerous or likely to cause loss of life or bodily injury, and that it may not be disposed of, without committing an offence under the Act, until it is satisfactorily guarded. The net result of such an enactment will be that manufacturers, dealers, &c., will get into touch with departmental Inspectors and ascertain what is required in the way of guarding, and provide it before the machine is sold. In other words, manufacturers, vendors, agents, &c., and departmental Inspectors will co-operate in the common cause of safety, and the costs of annual inspection and fees will be eliminated. If all the machinery were manufactured in New Zealand the problem would be a comparatively simple one, because we could deal with manufacturers direct, but, unfortunately, too great a proportion comes from overseas.

Examination of Land Engineers, Engine-drivers, and Electric Tram-drivers.

These examinations were held at the various offices of the Inspectors of Machinery throughout the Dominion at the regular intervals provided for in the regulations—namely, in the months of May, August, November, and February. In addition, a few special examinations were granted, but the holding of special examinations is not encouraged, as it is considered that the regular examinations are of sufficient frequency, and, except in very exceptional circumstances, candidates are expected to arrange that they may attend the scheduled examinations.

The full list of places where the examinations were held is shown in an appended return, as also is the number of candidates examined at each place. The classes of certificates for which examinations were held were: First-class engine-driver, second-class engine-driver, steam-winding-engine driver, electric-winding-engine driver, locomotive-engine driver, traction-engine driver, locomotive and traction engine driver, and electric-tram driver. The total number of candidates examined was 377; of this number 266 were successful and 111 failed in their examinations.

Prosecutions.

During the year legal proceedings for offences under the various statutes administered by the Department were instituted in eighty-one cases. Prosecutions under each Act were as follows: Fisheries Act, 52; Harbours Act, 5; Inspection of Machinery Act, 3; Shipping and Seamen Act, 21.

Fisheries.

The report of the Chief Inspector of Fisheries which is appended hereto deals exhaustively with sea and fresh-water fisheries.

From time to time there arises discussion on the subjects of the Government leasing the oyster-beds, or, alternatively, granting leases to individuals to create oyster-farms in localities where oysters do not now exist, or where only a few are to be found. As to the question of leasing existing beds, one has only to go back to 1908 when a license system was in vogue. The operations of the licensed men and their careless methods of picking so ruined the beds that the Department was compelled to take over the picking itself, and has ever since had to most carefully regulate the picking in order to ensure the preservation of the beds.

In considering this project it must be borne in mind that the reproduction of these oysters is a process of nature which can succeed only where natural conditions are favourable.

The reason why certain localities, within what may be termed generally the "Rock-oyster zone," produce good stocks of oysters, while other localities, also within the zone, produce no oysters, or very few, or of poor quality, is that the natural conditions, which cannot be controlled, are favourable or less favourable in varying degree to the point of unfavourableness, where there is no production. Investigations by departmental officers have definitely shown that even in areas where general conditions are normally favourable, seasons occur from time to time when, owing generally to adverse weather conditions and sea-temperatures, the "spatting," which is the fertilized ova, is very poor, or does not occur at all in measureable terms. Thus it may, and does, happen that from time to time—and last season is an instance—there is no reproduction, or a very small one, insufficient to maintain stock. Similarly, if much disturbed weather occurs during the fattening season, the result is a poor-quality oyster. It is for these reasons that the greatest discretion has to be exercised in resting backward beds and in fixing the opening and closing dates for the picking season.

Some while ago representations were made that Hokianga Harbour should be leased for the purpose of oyster-cultivation, as a result of which a special investigation was made by the Marine Biologist. This investigation showed that while sand-drift, poaching, and natural pests were responsible partly for the condition in which the beds were found, the main reason is that most of the rocks on which oysters have occurred are of a certain sandstone formation which results in thin flat oysters. The hopeless state of such beds as remain are here again largely due to adverse natural conditions. It was also found that there was no great abundance of mangrove oysters as compared with similar areas elsewhere.

It may be generally accepted that no amount of work or expenditure will produce even marketable, let alone profitable, oyster-beds in localities where natural conditions are not favourable.

As to the contention that artificial cultivation in such areas should be permitted by license, this appears to be largely based on the fact that artificial cultivation is extensively carried on in New South Wales; but clearly these contentions are not based on a knowledge of the conditions and costs in New South Wales.

In 1929 the Marine Biologist was sent across to New South Wales to investigate oyster-cultivation. It must be understood that water-temperatures and other conditions there are much more favourable than in New Zealand; and, further, that there is practically a twelve months' selling season during which oysters are in good condition as against generally four months in New Zealand. Nevertheless, in 1929 the poor class of oysters in New South Wales were selling at £3 5s. per sack and first quality at £4 12s. 6d.

In New Zealand natural-grown oysters are sold at £1 4s. a sack, containing about ninety dozen. This price returns the Department a reasonable profit. What, then, becomes of the contention so frequently put forward that the Department is making excessive profits, or that private enterprise could artificially cultivate oysters in localities where they do not prosper naturally and sell at a lower cost to the public than the Department can?

The Department is quite well aware that oyster-sellers, in Auckland in particular, resent our selling oysters in retail parcels at 1s. 6d. for approximately five dozen. The definite object of this is to keep the retail price to the public at a reasonable level.

Generally speaking, it seems that to grant licenses for oyster-cultivation in the areas spoken of is merely inviting people with no real knowledge of the subject to waste their time and money with no benefit to the public or any one else.

Experiments are being conducted by the Department in tray and stake cultivation. In the latter experiment lack of suitable timber is a big handicap, and it may be mentioned that this handicap is now being felt in Australia.

With regard to tray cultivation, it has already been proved that adverse climatic conditions affect the oyster-fattening on trays even more than the same conditions affect oyster-growing naturally on the rocks in the same locality.

As to the supply from beds operated by the Department, it is true that the supply, particularly in the very early part of the season, does not meet the demand; but this is being remedied as far as possible by the creation of further beds in suitable localities, by moving high-water-mark oysters to a lower level where they can secure more nourishment, and by destruction of the borer pest, which not only destroys the oyster, but leaves one part of the shell adherent to the rock, and on which oyster spat will fix, but the young oyster is lost before it reaches marketable size. This is caused by the dead shell rotting off the rock and allowing the young oyster to become loose.

Whaling in Ross Sea Dependency.

During the past year or two there has been quite a deal of public discussion on the question of what is termed unrestricted slaughter of whales, and the threatened extinction of the species.

At first the discussion was based on purely theoretical grounds, because no one was in a position to state what the existing stocks of whales amounted to; what the rate of reproduction was, and what rate of killing annually might be permitted without unduly depleting stocks. All the discussion arose in connection with whaling operations in the Ross Sea Dependency, which is now under the governance of New Zealand. Whaling in these waters is, of course, only a small part of the whaling operations carried out all over the world.

An aspect of the matter which has more recently been disclosed is that whale-oil has now become a serious competitor with tallow, and this is adversely affecting New Zealand producers.

I have contended, in previous reports, from the point of view of protection of whale-stocks, that overproduction would result in reduced prices, and reduced prices would result in forcing out of commission the older and less economic class of whaling factory and in reducing the activities even of the more up-to-date factories. This is just what has happened.

Tremendous quantities of oil caught last season are still unsold, and, so far as we can gather, none of the whaling factories will visit the Ross Sea Dependency this season; in fact, it would appear that on account of the huge quantities of unsold oil, a considerable proportion of the world's whaling fleet will not operate this season.

It is known that steps have already been taken by the industry itself to restrict production of whale-oil, in order to bring the selling-price back to an economic result.

I referred in a previous report to the effort of the League of Nations to regulate whaling. The League could not, of course, approach the commercial aspect of the matter; but did so from the point of view of preventing undue depletion of the whaling-stocks. Some further progress has been made, and New Zealand has actually signed the Convention. As the question is an international one, progress can be made only by international agreement. The present financial position of the industry should do much to clear the way for making the Convention itself more effective as an instrument to eventually regulate catching-power, which is the whole crux of the question so far as preservation of whaling-stocks is concerned.

Only certain countries have a definite interest in whaling and for this reason there is always a danger, if restriction goes further than can be reached by agreement, that there will be a transfer of flag of the fleets of an objecting country to another country, not a signatory to the Convention.

With regard to the question of the competition of whale-oil with tallow, and in so far as it does compete, the present position is that best tallow quotations are round about £20 per ton, whilst whale-oil, according to the *Financial Times*, is quoted at £11 15s. to £14 10s. per ton. This latter price is, of course, entirely uneconomic, and is due to the excessive overproduction. The *Financial Times* states that in the case of the more recently formed companies a profit result is based on £25 per ton, and prices have been as high as £30 per ton. Prior to last season it had been the practice to buy the oil before it was caught; but this did not obtain last season, nor will it apply this season. If whale-oil is a serious competitor with tallow, it is curious to note that tallow maintains a higher market price.

The whaling industry, in addition to restricting production, is also known to be searching for new avenues of use. The state of refinement to which whale-oil can now be brought, freed from greasiness and odour, may readily enable its use for new purposes.

Apart from all this, however, whale-oil and tallow are produced in many parts of the world, and are articles of world commerce, the prices of which can in no way be regulated by anything New Zealand can do. It has been suggested by farming interests in New Zealand that the Government should take steps to strictly regulate the whaling catch in the Ross Sea, and impose a higher royalty rate on oil taken. New Zealand cannot itself do either, nor will the Convention enable it to do so.

The license issued by the Imperial Government to the Rosshavet Co. and subsequently transferred to the New Zealand Government for administration, permitted two floating factories, and imposed a royalty of 2s. 6d. per barrel (40 gallons) of oil, with an exemption from royalty on the first 20,000 barrels, on all oil taken in the territorial waters of the dependency.

The company duly paid such royalty as was payable on all oil taken (except 20,000 barrels) up to and including the 1927–28 season, after which it refused to pay, on the ground that it had not taken any oil in territorial waters, and would continue to refuse to pay royalty, except on any oil which it might take in territorial waters. As a matter of fact, it is known that in seasons when a departmental Inspector has been with the expeditions and in respect of other seasons from the ship's papers they have not fished in territorial waters. It is believed that the company, though not legally liable to do so, would have been agreeable to pay, probably having regard to the value of its license in the event of licenses being restricted; but the advent of unlicensed ships in the Dependency, and which paid no factory rental or royalty, created an embarrassing position as between directors of the company and shareholders, who were also shareholders in the unlicensed companies. The Department considered the advisability of cancelling the license, and/or imposing any other disability legally possible; but this would have served no good purpose, and would probably have resulted in transfer of base to our nearest neighbour, who provides special facilities to attract these vessels, because of the money they spend in the port in fitting out.

In the case of the "Southern Princess," this license was negotiated by the Department with the result that, in respect of the season in which she fished in the dependency, she paid royalty on all oil taken. This vessel will not visit the dependency this season and, therefore, we will receive no royalty whatever.

The following table shows the number of whales taken and whale-oil secured from the 1923–24 season onwards:—

Season.	Whale Factory.	Number of Whales.	Barrels of Oil.
1923–24 ..	"Sir James Clark Ross"	221	17,791
1924–25 ..	"Sir James Clark Ross"	427	32,165
1925–26 ..	"Sir James Clark Ross"	531	37,700
1926–27 ..	"Sir James Clark Ross"	254	22,800
1926–27 ..	"C. A. Larsen"	532	47,500
1926–27* ..	"N. T. Nielsen Alonso"	450	36,000
1927–28 ..	"Sir James Clark Ross"	616	48,000
1927–28 ..	"C. A. Larsen"	839	76,000
1927–28* ..	"N. T. Nielsen Alonso"	725	58,000
1928–29 ..	"Sir James Clark Ross"	545	49,000
1928–29 ..	"C. A. Larsen"	795	73,000
1928–29* ..	"N. T. Nielsen Alonso"	765	63,500
1929–30 ..	"Sir James Clark Ross"	450	30,820
1929–30 ..	"C. A. Larsen"	1,082	77,000
1929–30 ..	"Southern Princess"	874	61,370
1929–30* ..	"N. T. Nielsen Alonso"	745	56,000
1929–30* ..	"Kosmos"	1,822	116,000
1930–31 ..	"Sir James Clark Ross"	1,443	112,500
1930–31 ..	"Kosmos"	..	160,000
1930–31* ..	"N. T. Nielsen Alonso"	..	105,000
			1,280,146

* Unlicensed factories whose records it has not been possible to authenticate.

NOTE.—One barrel = 40 imperial gallons.

WESTPORT HARBOUR.

The following statement shows the net tonnage of shipping entered the port, the tonnage of coal shipped and the financial result for each year since the Department has had control of the harbour :—

Year.	Net Tonnage of Shipping entered.	Tonnage of Coal shipped.	Financial Result.	£	s.	d.
1921–22	273,706	480,873	Deficiency	38,113	2	7
1922–23	332,401	573,487	,,	12,038	9	4
1923–24	275,762	442,070	,,	4,333	14	7
1924–25	334,827	556,669	Surplus	5,711	17	0
1925–26	386,669	552,949	,,	5,630	8	0
1926–27	459,670	637,165	,,	10,207	1	4
1927–28	466,021	623,256	,,	81	6	6
1928–29	458,712	604,778	Deficiency	4,657	7	6
1929–30	479,623	625,835	Surplus	1,397	6	10
1930–31	352,228	513,503	Deficiency	423	13	10

The loss for 1930–31 amounted to £423 13s. 10d. after making full provision for all charges in the way of depreciation, interest, and sinking fund, although during the past seven years the average annual profit has been £2,563 16s. 11d., the whole of which has been put into harbour-improvement works.

It is interesting to note that in the first year of the Department's administration of the port there was a deficiency of £38,113, with a coal-export of 480,873 tons, while in 1930–31 the deficiency was only £423, qith a coal-export of 513,503 tons.

There has been a serious falling-off in the coal trade from Westport, as will be seen from the figures above. A stage was reached when in the year 1929–30 bunker-coal trade amounted to 61,000 tons ; but this fell away to practically nothing, due partly to unreliability of supply and partly to the rate of exchange on payments for coal. The accounts for most of the overseas ships which took bunker coal from Westport were paid from London. With the rate of exchange as between London and Newcastle at, say, 30 per cent., and between London and New Zealand at, say, 10 per cent., payments for £100 worth of coal taken at Newcastle required only £70 to be remitted, while to New Zealand £90 had to be remitted. But bunker coal for overseas ships has been only one aspect of the matter. Whatever the reasons—and they are not all such as cannot be avoided locally—there has been a serious falling-off in the coal trade, with resultant decline in revenues. An average of 40,000 tons per month coal-export from Westport is the minimum necessary to provide sufficient money for maintenance of essential port services. In September the export fell to 24,000 tons.

Practically the whole of the Department's revenues are dependent on coal-production. The Department has no other financial resources than these revenues, and must confine its expenditures within that sum. Consequently it has become necessary to discontinue the breakwater extension, which was being effected by the aid of surplus revenues. Unless there is a marked increase in the trade of the port, it is clear that still further economies will have to be effected.

Whilst this is the position at Westport, it is interesting to note that in the calendar year 1929 214,268 tons of coal were imported from Australia ; in 1930, 154,096 tons ; and for nine months in 1931, 156,178 tons. One may be entitled to wonder why freight can be paid for 1,200 miles and Australian coal still compete against New Zealand.

G. C. GODFREY, Secretary.

FISHERIES.

SIR,— Wellington, 28th July, 1931.

I have the honour to submit my report for the year ended 31st March, 1931.

Failing the requisite legislative and financial provision for collecting data with the continuity and completeness necessary to afford a truly statistical record of the fishery, the information as to the vessels and men employed and the quantities of fish landed during the year has been obtained by the customary method of getting an annual return from local Inspectors of Fisheries. As has been previously pointed out, this method has many serious defects and gives a very inadequate representation of the character and productivity of the fisheries.

During the year an Order in Council has been gazetted (19th February, 1931) requiring owners of licensed fishing-vessels to make monthly returns of the quantities of fish landed; but the general operation of this Order is deferred owing to the lack of staff to carry out the necessary work of collecting and collating the records.

The information obtained from the various fishing centres has been tabulated as shown in Tables I to V appended to this report. The estimated total quantity of wet fish (including whitebait) landed in the Dominion for the year was 370,766 cwt., valued at £418,726. The total amount is somewhat higher than the figure for last year (367,647 cwt.), but this is due to the fact that the collection of returns has been a little more comprehensive. The total value for wet fish landed shows an appreciable drop—from £449,440 to £418,726.

The data provided by the returns sent in are too heterogenous to admit of any rational analysis, but on the basis of our general information it may be said that increases of production in some areas are more or less balanced by decreases from others. The decline in value is to be ascribed to a falling-off in demand for fish, arising out of the general economic conditions.

The following summary shows the total production from the New Zealand fishing industry for the year:—

	Quantity.	Value. £
Wet fish	369,346 cwt.	406,675
Whitebait*	1,420 cwt.	12,051
Dredge oysters	42,744 sacks	26,715
Rock-oysters	5,215 sacks	6,258
Mussels	6,224 sacks	2,039
Crayfish	2,730 cwt.	4,733
Toheroas (canned products)	750 cwt.	4,204
Whale products—		
Oil	340 tons	8,147
Fertilizer	80 tons	
Quinnat salmon (netted fish only)	9,427 lb.	354
Total value		£471,176

* Partial return. Total would be considerably higher.

Arising out of the necessity for patrolling the State-owned oyster-beds and beaches in the Auckland District, we have here a staff of departmental Inspectors of Fisheries, and it is thus possible to obtain information about the general fisheries which is gathered from systematic local observations and inquiry. The data are not so useful for the purposes of annual reports as they would be if collected at intervals throughout the year in accordance with a statistical scheme, such as was recommended in last year's report. The annual totals of fish-landings for Auckland are collected from the fish-depots of the port, and the figures representing the sum total may be regarded as satisfactorily approximating to accuracy.

The total landings of fish at Auckland—104,098 cwt., valued at £88,947—show an increase of approximately 8·7 per cent. in quantity and 12·3 per cent. in value over the corresponding amounts for the previous year, but do not approach the peak figures (134,040 cwt., value £119,482) shown for the year 1927–28.

As in the previous year, the Auckland steam-trawlers divided their operations between the lower Hauraki Gulf, off the Great Barrier Island, the Bay of Plenty, and the west coast. The full utilization of the western grounds is not only handicapped by more adverse weather, but is discouraged by the inferior market value of the big snapper obtained on these grounds as compared with the medium-sized fish of the Hauraki Gulf.

Except when bad weather interfered with the operations of the Danish-seining and line-fishing launches, the fishing in the Hauraki Gulf was fairly consistently good, some of the Danish-seine catches at times approaching the quantities seen in the early years of this method of fishing. In the snapper "schooling" season several of the seiners took to long-line fishing with good results, but the fish thus caught were of bigger size than is in most demand in the Auckland markets.

The dab and flounder fishing on the "Dab Patch" in the mouth of the Thames Firth was good, but not so productive as last year.

In spring and summer, with the onset of warm weather, there is normally a decline in the demand for fish, but this year the market for fish was weaker than usual, owing to the bad times and to the decreased price of meat. This condition applies generally to the whole of the Dominion.

The Thames fisheries, on the whole, had a fairly good year. An increased number of vessels worked at all classes of fishing, more especially at Danish seining and long-lining, and more fish came into the depots, both from the Thames boats and overland from Mercury Bay, than in the previous year. During the months of September, October, and November a limit was placed on the quantities of flat fish caught, the supply exceeding the demand, owing, presumably, to the failure of the usual Australian market.

It is reported that some of the Danish-seine fishermen were this year for the first time put on a wage-payment system, instead of on shares—a further indication that supplies were more than able to cope with demand.

Sharks of all sorts, mainly small, were unusually abundant in the Auckland District, and especially in the Thames Firth, during the summer, and were a nuisance to both line and net fishermen. There would appear to be scope for a fish-reduction (oil and meal or fertilizer) plant at Thames which, besides dealing with the usual fish offal, would be able to make profitable use of these at present merely noxious fishes. The difficulty is that they are not of constant occurrence. They make their appearance in the upper part of the Firth of Thames with remarkable regularity at the beginning of each summer, but their abundance varies from year to year.

Prior to the disastrous earthquake on the 3rd February, 1931, the Napier fishing fleet had been operating with more than average success. Flat fish are reported to have been in considerable abundance, and catches of round fish better than the average of the last few years. After the earthquake the demand for fish at Napier went down, and, with the wharves raised about 7 ft. above their original level, the difficulties of coaling, filling water-tanks, and landing fish have been considerably increased. The number of trawlers operating and the time each spent on the fishing-grounds have consequently suffered a temporary diminution. From information gathered from various skippers it would appear that the trawling-grounds have not altered to any appreciable extent, except in the vicinity of Clive and Tangoio. Off Clive the bottom, originally hard, is now covered with blue mud, which makes it impossible to tow a trawl. Prior to the unheaval the ground off Tangoio was also smooth and firm, and most suitable for trawling, but a considerable area of ground has since been found to be foul from the presence of stumps of trees, on which several nets have been lost or damaged. Many cockle and pipi beds in Hawke's Bay have been totally destroyed by having been lifted above the level of the tides.

With regard to the fisheries of the Wellington District we have not the close acquaintance and systematic information which are desirable and necessary. The fishing for the year was not up to average productivity. This is partly owing to the abnormal prevalence of stormy weather, but there also appears to be reason for concluding that the well-fished grounds in the neighbourhood of Cook Strait have been more intensively worked of recent years than is consistent with rational and economical exploitation. The question is a very complicated one, however, and cannot be elucidated until truly statistical evidence as to the results of fishing operations is available.

The sea-fisheries of Canterbury and Otago were considerably affected by bad weather. Apart from this, however, there was in certain areas a general scarcity of line fish, especially of groper, and the opinion has been generally expressed among Otago fishermen that it is advisable to place restrictions upon the taking of these fish at the season when they are spawning or about to spawn. The use of long lines has lately become more prevalent for groper-fishing. Some fishermen are inclined to ascribe the present scarcity to this practice, thinking that the dead fish on long lines, which are not infrequently lost, tend to pollute the fishing-grounds. I do not think there is any likelihood of appreciable pollution thus occurring. The effect of long lines, in my opinion, is to bring about a decided increase in the number of fish abstracted from an already depleted stock. The question demands more investigation than I have been able to give to it. Restrictions on the fishing by regulation would not be easy to apply without bearing hard upon certain classes of fishermen, but if the grounds for the necessity of such restrictions were clearly apparent there would be no hesitation in recommending them.

The trawl fisheries, especially off the Canterbury coast, have apparently been better than average. In summer and autumn good catches of dabs (sand-flounder or "three-cornered flounder"—*Rhombosolea plebeia*) of large size were landed.

It was remarked that the pelagic crustaceans popularly known as "whale-feed" (*Munida gregaria*) were about two months later than usual in appearing in the inshore waters of Otago. They usually enter Otago Harbour during the first week in November, but this year they had not put in an appearance at the end of December. This had a marked effect on the inshore fisheries, since fish of various kinds invariably follow the shoals of "feed" when they come in.

The blue-cod fisheries pursued by the fishermen of Stewart Island and Chatham Islands are largely dependent upon the export trade, and the depression of the Australian markets seriously affected the demand for the produce of these fisheries, to the great detriment of the fishermen and merchants.

The West Coast fisheries (South Island) still remain relatively unexploited owing to absence of local consumers and remoteness from the markets of the larger centres of population. This year more regular supplies were landed at Greymouth from the operations of a Westport steamer working the Danish seine, which is now to be permanently established at Greymouth.

The statistics of imports and exports of fish and shell-fish for the year are shown in Table V, in which the exports of frozen blue cod, snapper, and flounders are separately distinguished, as are also the ports from which frozen fish was shipped. This year, for the first time, the exports of tinned whitebait and toheroas, as well as oysters, are separately shown.

The following summary table shows the quantities and values of various classes of fish and shell-fish exported from New Zealand during both the past year (1930–31) and the preceding year (1929–30), and the differences between the two years.

	Year 1930–31.		Year 1929–30.		Decrease (−) or Increase (+) in 1930–31 compared with Previous Year.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
		£		£		£
Frozen fish	17,678 cwt.	47,047	22,760 cwt.	64,772	−5,082 cwt.	−17,725
Fish, smoked, dried, pickled, or salted	1,128 cwt.	3,744	414 cwt.	1,208	+714 cwt.	+2,536
Potted and preserved in tins—						
Oysters	15,079 lb.	1,207	20,316 lb.	1,701	−5,237 lb.	−494
Other kinds	87,063 lb.	8,674	109,172 lb.	14,575	−22,109 lb.	−5,901
Value of total exports ..	..	60,072	..	82,256	..	−22,184

With regard to frozen fish, tinned fish, and tinned shell-fish, these differences represent substantial decreases in both quantity and value. The decreases may be ascribed to the economic depression in Australia, which is practically our only customer for frozen fish and by far the most important market for the other classes of export.

The decreased purchasing-power of fish-consumers in New Zealand and Australia under the now existing economic conditions will undoubtedly result in a marked diminution in fish-landings, and a still more marked drop in values, for next year. In some cases the voluntary restriction of fishing operations in accordance with diminished demand may be beneficial to fish stocks now in danger of depletion. But, on the other hand, there is the disturbing prospect that the industry, already prevented by lack of adequate capital from operating with the efficiency that is desirable, will suffer a setback that will keep us tied still longer to the obsolete or obsolescent methods in the catching, marketing, and distribution of fish which now prevail in the Dominion. What can be done about it is too complicated a question for present discussion. I hope to make some remarks on the fisheries in relation to national economy in a further section or appendix to this report.

Rock-oysters.

Oyster-picking for the 1930 season was commenced on the 11th June and finished on the 17th September. Forty-five men were employed on the beds. The number of sacks of oysters taken from the different areas was as follows: Bay of Islands, 2,522; Kaipara, 699; Hauraki Gulf, 1,109 (Takatu to Gull Point, 437; South Shore, Tamaki Strait, 70; Kawau, 20; Motutapu, 202; Motuihi, 99; Waiheke, 58; Ponui, 156; Pakihi, 53; Crusoe Island, 14); Coromandel, 309; Great Barrier Island, 576: total, 5,215 sacks; value, £6,258.

The beds on the islands in the Gulf and on the Coromandel side were lightly picked in view of the fact that the "spatting" (reproduction) has been deficient of recent years on these shores. The market demand was not so keen as the previous year, owing, doubtless, to diminished purchasing-power among the general public.

Oyster-cultivation.

The cultivation work carried out during the year consisted principally in the collection and destruction of "borers." A total of over nine millions of these oyster-pests was disposed of. This work is now done in the winter months, since it has been discovered (see report for 1928–29, p. 19) that this mollusc spawns in the spring. The former plan of collecting borers from October to January merely removed the adults after they had left behind a new generation. When possible, the collection of borers was paid for at a piecework rate of 1s. per thousand. The effects of the persistent borer-destruction of the last three years is now very apparent on most of the oyster-shores, but the quantities are still great in the Kaipara and on some of the Coromandel beds. With regard to the former areas, where the reproduction of oysters is fairly copious and regular, the losses by borer-attack are of no great consequence and may even result in a certain amount of beneficial "thinning," but on the sparsely stocked Coromandel beds the effects of the borer pest are serious. The most important of the other cultivation work was the moving-down of high oyster-bearing rock to the level of optimum growth. The details are summarized in the table which follows.

Area.	Number of "Borers" destroyed.	High-water Oyster-rock removed.	Other Work.	Cost.
		Sq. yds.		£ s. d.
I. Bay of Islands	632,850	..	3,190 "pupu" destroyed	75 14 2
II. Whangarei Harbour ..	113,975	670	989 "pupu" destroyed; 130 yds. of new rock walls; 120 yds. of rock cleaned from shell and 125 yds. from weed	25 6 8
III. Kaipara Harbour ..	3,929,700	..	..	196 9 0
IV. Takatu to Gull Point (including Mahurangi Harbour)	1,475,150	45	1,587 "pupu" destroyed; 390 yds. rock cleaned from old shell	65 17 0
VI. Coromandel coast ..	1,400,000	..		70 0 0
VII. Kawau	641,800	..	244 "pupu" destroyed	31 3 0
XIII. Waiheke	278,000	..	450 "pupu" destroyed	19 6 8
XIV. Ponui	101,000	..	224 "pupu" destroyed	6 12 4
XVI. Great Barrier Island ..	503,400	..	..	25 3 6
Totals	9,075,875	715		515 12 3

In addition to the above operations, which have been carried on because they are known to have a definite practical value, experiments are being made in other methods of oyster-cultivation at present unproved under New Zealand conditions. It will be more appropriate to refer to them in the section dealing with scientific investigations (see p. 23) since the work has been for the most part initiated and organized by the Marine Biologist, Mr. M. W. Young, to whose assistance the more systematic recording of the results of the industrial oyster picking and cultivation is also due.

Dredge Oysters.

The Bluff fleet of seven steam oyster-dredgers operating in Foveaux Strait had a successful season and their total landings of 42,744 sacks showed an increase of 8½ per cent. above those of the previous year. The catches were steadily maintained throughout the season, with the usual decline owing to diminished demand at the end of the period. The quality of the oysters was excellent, but it was marred towards the end of the season by the occurrence of an appreciable proportion of spawny oysters. Seeing that the oysters were in good edible condition before the commencement of the open season, it was decided to put forward the opening of the season by one month for the following year. Towards the end of the season a new company commenced canning oysters at Bluff.

Toheroas.

The output of the two toheroa-canneries in the North Auckland district for the 1930 season was 2,336 cases, a great decline from the previous year's production, due, doubtless, to the weaker export market.

In April, 1930, there was considerable mortality among the toheroas on the Ahipara ("Ninety Mile") Beach. The losses were confined to one portion of the beach, about eight to ten miles in extent, commencing about twenty-five miles north of Ahipara. The remainder of these extensive beds were unaffected and are well stocked. The deaths are to be ascribed to the covering of the beach with dry sand blown from the sandhills on the landward side by the strong and continuous easterly winds which had prevailed, the toheroas presumably being suffocated. It was noticed that the large-sized shell-fish were affected more than the smaller ones. Similar mortality, but not perhaps on so large a scale, had been noticed in former years when strong easterlies had been blowing.

The beds on the cannery leases on the North Kaipara Beach are very well stocked with toheroas of all sizes.

No special mortality was reported from the North Kaipara Beach. Here it was remarked that during the 1930 canning season, which occupies the winter months, the condition of the toheroas handled at the factory was clearly below average. This was indicated by the bulk ratio between the unshelled and shelled toheroa. The normal ratio is as 6 to 1. This season it was 8 to 1. As for the explanation, it is also in all probability to be found in meteorological conditions. As is well known to those working in the toheroa industry, these bivalves are in their best condition in winter. It has been noticed that they very perceptibly improve after the autumn rains have set in, and that there is at the same time a remarkable development of a greenish-brown scum on the beach and in the water. This scum has been found to consist of microscopic algæ belonging to the class called diatoms; and it undoubtedly affords an important, if not the principal, source of food for toheroas. Last season the appearance of this scum was delayed for some weeks later than its usual time, and this was probably in consequence of the prolonged autumn drought. Soon after its appearance the condition of the toheroas showed appreciable improvement. It is noteworthy that all the beaches on which toheroas are found in quantity are subject to the more or less continuous effects of fresh water. This may reach the beach by percolation through sandhills from lagoons situated behind them, or from small creeks, or from springs in the cliffs. It seems probable that the presence of this fresh water is a factor which affects both the feeding of toheroas and their survival in the earliest stage of their existence on the beach.

There is real need not only for more extensive and intensive surveys of quantitative distribution, but also for more systematic and intensive biological research into the natural history of the toheroa. It may be claimed that our intermittent efforts have secured sufficient knowledge to afford a basis for a sound conservational administration, but the hope of ever doing anything to develop and improve these natural resources depends entirely upon a thorough grasp of the physical and biological factors affecting the reproduction, growth, and distribution of these valuable bivalves.

Although the systematically worked and well-conserved beds of toheroas on the cannery leases are in a well-stocked condition, there is no doubt about the present state of depletion on the more accessible beaches, such as the southern portion of the Muriwai Beach and those parts of the North Kaipara Beach which are nearest to the road approaches from Dargaville. The increase in the number of motor-vehicles, and improved accessibility for the same to the various beaches, have considerably increased the inroads made on the toheroa stocks not only by private parties, but also by people who dig toheroas for market purposes. The beds clearly cannot withstand such intensive exploitation. Regulations have been framed to deal with the position, and the desirability of bringing them into force forthwith cannot be too strongly emphasized. A difficulty is that these toheroa beaches are somewhat isolated and remote from other fishery interests, and are therefore scarcely ever patrolled by an Inspector of Fisheries. The removal of this deficiency, as against the moderate expenditure involved, would in the long-run be a real economy.

Mussels.

Although in various places considerable quantities of mussels are gathered for private consumption, and Maoris more especially regularly make use of this nutritious sea food where it is obtainable, the only venue of any considerable commercial fishery is the Hauraki Gulf, where a few boats are regularly engaged in dredging deep-water mussels. These are of large size and fine flavour, and the best are to be obtained in the vicinity of Coromandel Harbour and along that coast as far as Tapu. The retail shops of Auckland are supplied largely from these beds; also a small cannery at Coromandel. From time to time mussels have been preserved by drying and smoking, and marketed in this form, but this trade has never been very considerable. The most recent process of mussel-utilization, and one which seems certain to be developed considerably in future, is the production of a shell-fish soup-powder by the desiccation of these bivalves. The commodity, possessing the two important advantages of being imperishable and concentrated, is in demand as an export. If the people of this Dominion sought the kinds of food which are requisite for healthy body-building there would be a demand for all the shell-fish supplies that can be obtained—either fresh or in a preserved state. These shell-fish contain adequate amounts of the element iodine, in which New Zealand foodstuffs generally are very deficient. This deficiency has been correlated with the prevalence of goitre and is now authoritatively regarded as the prime cause of that disease.

In view of the increasing utilization of these shell-fish, it is very desirable to extend our knowledge of their natural distribution and to take steps to keep in close touch with their industrial exploitation, which can best be achieved by enacting that such exploitation should be done under license.

Quinnat Salmon.

Hatchery operations at Hakataramea, for the first time in charge of Mr. J. S. Main, were commenced early in March, 1930, the rack in the Hakataramea River being completed on the 8th of that month. It was kept in the river till the 10th July. As mentioned in last year's report in describing the 1930 fishing season, the river conditions were quite exceptional, and the salmon run was apparently considerably affected thereby. The numbers of fish which came up from the sea were abnormally few, and the majority of them kept to the main stream, which remained at a very low level and, with the exception of light temporary freshes in the middle of April and again in May, continued to fall throughout the spawning season.

The Hakataramea River was unusually low and foul with blanket-weed. Its confluence with the north branch of the Waitaki did not provide a very good "lead" for the running salmon, but the outflow channel was improved early in April by banking the shingle.

The first salmon was taken on the 22nd April and the last on the 25th June. The catches were as follow:—

	Males.	Females.	Total.
April	34	9	43
May	237	110	347
June	18	10	28
Totals	289	129	418

Several fish, some of which were half-spent females, were taken by netting the river below the rack. A remarkable feature of the run was the exceptional number of small males. The number of quinnat ova laid down in the hatchery was 577,000, of which 500,000 were sent to the Maori Creek Hatchery for the liberation of fry in the Wairau River and its tributaries; 20,000 were sent to New South Wales, and from the remainder 50,000 fry were hatched out and liberated in the Hakataramea River and about 7,000 fry were kept in a pond to the yearling stage.

The poor yield from the hatchery operations was matched, so far as our observations went, by the scarcity of spawners in the tributaries usually visited by quinnat salmon. The Ahuriri River and the Otamatakau (Otamatata) Rivers, two important spawning tributaries of the Waitaki, were visited by Mr. Main on the 24th April. In the former very few fish, mostly males, were observed, and no spawners were seen in the latter, although a few were seen lying off its mouth in the main river. Deep Creek, a tributary of the Rangitata in the Mesopotamia country, which is usually thronged with quinnat salmon in winter, was visited by Mr. Main on the 1st May. He reported that the run was the poorest he had ever seen there in an experience of many years—"half-dozens where there used to be hundreds" on the redds. On the other hand, it seems highly probable that, at least in the Waitaki, a larger proportion than usual spawned in the main river. It is certain, however, that the runs of quinnat from the sea were, on the whole, well below the average abundance of recent years, and the propagation of the 1930 year group may be expected to be proportionately deficient. It may be mentioned that a "big run" of quinnat was reported on good authority to have entered the Rangitata in the second week in June, by which time the spawning is practically over in normal years.

This year's quinnat-fishing season presented a complete contrast to that of 1930. Last year after the summer floods subsided in February the rivers remained low. Although the fishing-conditions were for the most part favourable, anglers were generally less successful than usual, with the exception of those who fished the lower Waitaki. This year the four best quinnat rivers have been almost continuously high and discoloured owing to the effects of the prevalent north-westers in the mountains. There was good fishing in April in the Rakaia and Rangitata Rivers while the water was in good order,

which was not for very long. In the lower Waitaki, which during last year's drought produced a record catch for anglers, the conditions were impossible, and the few odd fish obtained were foul-hooked. Police Constable Berry, Inspector of Fisheries at Glenavy, reported that salmon were first seen running as early as the 29th November and entered the river early in December, but no fish were caught. The river became flooded and discoloured on the 3rd January and remained so for the whole season. Odd fish were seen rising in January and February. A good run was observed on the 28th February, and salmon continued to move every day till the 22nd March, but no very approximate idea of the numbers running could be obtained from the observation of rising fish. The only Waitaki fish caught by anglers were taken in the higher waters, in the Hakataramea, Ahuriri, Ohau, and Pukaki tributaries. A quinnat weighing 47 lb. was caught in the Ahuriri River. Good runs entered the Waiau-ua and Hurunui Rivers in North Canterbury, and there were again reports of fish entering the Opihi and Orari Rivers. The South Canterbury Acclimatization Society's annual report states that possibly two hundred were caught at the mouth of the Opihi.

It is impossible to get an approximate idea of the numbers of fish taken by the numerous quinnat-salmon anglers in the Canterbury rivers. From the returns sent in by those holding licenses for the sale of rod-caught fish the following statement of catches has been summarized :—

——	Males.	Females.	Sex not given.	Total.
Waimakariri River, 18/2/31 to 21/4/31 (three rods)—				
Number of fish caught	10	9	..	19
Weight of fish, in pounds	171	143	..	..
Average weight, in pounds	17·1	15·8	..	16·5
Rakaia River, 21/2/31 to 30/4/31 (eleven rods)—				
Number of fish caught	89	83	38	210
Weight of fish, in pounds	1,286	1,164	548	2,998
Average weight, in pounds	14·4	14·0	14·4	14·3
Rangitata River, 16/2/31 to 28/4/31 (fourteen rods)—				
Number of fish caught	102	104	11	217
Weight of fish, in pounds	1,651	1,746	169	3,566
Average weight, in pounds	16·2	16·8	15·4	16·4
Combined rivers, 16/2/31 to 30/4/31 (twenty-five rods, three of which fished two of the above rivers)—				
Number of fish caught	201	196	49	446
Weight of fish, in pounds	3,108	3,053	717	6,878
Average weight, in pounds	15·5	15·6	14·6	15·4

After the season had opened it was decided to allow netting on the lower Waimakariri, and licenses for four nets were accordingly issued at the beginning of March. This fishing was restricted to the tidal waters below a point about one and a quarter miles from the mouth, and no netting was allowed from Friday midnight till Sunday midnight. The first fish was caught on the 4th March and the last on the 7th April. The following statement shows the number and weight of fish taken by the four nets :—

——	Males.	Females.	Sex not Distinguished.	Total.
Number of fish caught	193	202	337	732
Weight of fish, in pounds ..	2,319	2,578	4,530	9,427
Average weight of fish, in pounds	12·0	12·8	13·4	12·9

The annual yield of salmon-netting operations from their commencement in 1925 to the present time is shown in the following table :—

Waimakariri River.

Year.	Number of Nets licensed.	Number of Fish caught.	Total Weight of Fish caught.	Average Weight of Fish.
			lb.	lb.
1925	5	184	1,917	10·41
1926	8	1,126	13,121	11·7
1927	4	767	8,553	11·2
1928	4*	2,514	28,006	11·1
1929	..	..	..	..
1930	..	..	..	..
1931	4	732	9,427	12·9

* This includes one net operated by the Marine Department.

For the Rangitata River one netting license was issued in the years 1925 and 1926, but the fishing was unsuccessful. No salmon were caught in one season, and about three in the other season.

For the Waitaki River one netting license was taken out in 1927. No fish were caught.

For the Clutha River one netting license was issued in 1927. No fish were caught.

Some of those interested in rod fishing for quinnat salmon have criticized the policy of the Department in allowing the use of nets for this fishing. Their contentions, as voiced in the Christchurch newspapers when netting licenses were previously issued, were discussed in my report for the year 1927–28 (p. 9). It seems advisable to state the position as it now appears.

In the first place, this species of salmon was imported by Government and acclimatized in the Waitaki River for the purpose of founding a commercial salmon-fishery in this country. It was hoped, in fact, that commercial salmon-canneries would be the ultimate outcome. The quinnat salmon has spread by natural migration to the other large Canterbury rivers. Some few years ago a certain number of anglers criticized the introduction of quinnat salmon on the ground that it was not a sporting fish, that its presence in the rivers was a menace to young trout, and that the rivers were in danger of being polluted by the bodies of salmon which die after spawning. The quinnat have proved to be a very popular sporting fish since anglers have learned how to catch them. One suspects, however, that the value of the catch, as well as the fighting propensities of the fish, has a good deal to do with its popularity in many cases. Quinnat do not feed after they have entered fresh water in their spawning migration, so that their predations among other fresh-water fishes are simply non-existent. The pollution which may be caused by their corpses is negligible, and possibly even beneficial to the rivers, which are by no means rich in organic material, and the products of decomposition will ultimately serve as fertilizing-elements for the production of the microscope vegetation which is the requisite basis of animal-life in the water. The high hopes once entertained as to the commercial developments of this fishery are not likely to be realized. Both breeding-grounds and feeding-grounds are less extensive here than in the native haunts of the quinnat in North America, and these are the factors which finally decide the amount of the stock. Nevertheless, 61,024 lb. (27 tons) of salmon has been marketed during the five years in which netting was allowed, and for the last two years (1930 and 1929) during which returns have been made by rodsmen holding selling licenses 9,430 lb. and 8,184 lb. respectively have been caught by these licensees. Thus over 78,000 lb. of salmon has been made available to New Zealand consumers from a strictly limited commercial exploitation of the quinnat fishery.

It has been said that the result of unrestricted netting in the Waimakariri will be to deplete the stock of salmon. If this statement were true it would be an unanswerable reason for the discontinuance of netting. But the netting is not unrestricted: it is limited to five days each week, leaving the forty-eight hours from Friday midnight to Sunday midnight clear for the salmon to run unmolested by nets and for the rod men to fish for them without hindrance. The number of netting licenses issued is limited to four, and the area for netting is limited to one mile and a quarter only up from the river-mouth. Within this area the places where the hauling of a seine net is practicable are very restricted, and the netting is hindered or rendered impracticable when the river is in flood. Some Waimakariri anglers have expressed the opinion that netting is beneficial to those fishing with rods above the netting-area, in that it disturbs the fish and induces them to run farther up the river. The possibility of depletion is one that should be carefully watched, and there is no better method of obtaining observations as to the magnitude of the salmon runs season after season than by the analysis of the records of catches of a definite number of fishing-engines under known conditions. The nets provide these records, but regarding the yield of the rod fishery we can get only the most exiguous information.

It may also be remarked once more that the Waimakariri has been stocked by natural migrations from the more southerly rivers, and there is no reason to conclude that such migrations have ceased to take place. Investigations on such points are very desirable, and it is to be hoped that provision will be made for such investigations as soon as possible. It has been found that netting is not practicable on any of the other rivers. This is certainly unfortunate, for, the Waimakariri being the most accessible to Christchurch and conveniently reached by rail or by means of cycling, it is a most popular resort for the salmon-anglers from that city, whereas the Rakaia and Rangitata are mainly fished by motor-car owners. The real difficulties are thus imposed by nature rather than by departmental regulation. The position is that if appreciable quantities of quinnat salmon are to be made available for market and for consumption by a wider circle of the public than can be reached by anglers' supplies, and if we are to obtain more comprehensive records regarding the runs of salmon than can be gathered from anglers' information, some net fishing must be carried on.

It should be carefully restricted, and, I trust, it will be carefully restricted. So far as the Department is concerned, it could certainly derive more revenue from the numerous rod fishermen if a special salmon-fishing license fee were exacted than it obtains from four netting licenses. However, I do not advocate fishery regulations from the point of view of revenue returns.

There is a further problem in relation to quinnat-salmon acclimatization which it seems desirable to touch upon, since it has recently been a subject of discussion among some acclimatization-society members who are interested in making the best use of their fishing-waters—the effect of a stock of quinnat salmon upon the trout stock of the same river. The statement has been made that the present stocks of quinnat in the Canterbury rivers have had a deteriorating effect on the trout population. Before one can arrive at and state a definite conclusion with regard to this question it is necessary to demonstrate in some detail how such an effect is produced. If one is content with saying that formerly the trout-fishing was good, and now, since the quinnat have increased, the trout-fishing is poor, one is likely to be met with the objection that deterioration of trout-fishing has taken place in other rivers where the quinnat factor is absent—that there are, in fact, other conditions which may

deteriorate the trout-fishing, such as an increase in the number of anglers, a succession of unsuccessful spawning seasons, insufficient stocking, or diminution of food-supplies. It is obvious that the appearance of millions of young quinnat in the tributary streams will have some effect on the growth of young trout by the additional competition for food which is thus introduced. At the same time, these young quinnat will afford an addition to the food-supply of big trout. There may be competition between quinnat and trout for the most suitable spawning-beds; the quinnat may drive away trout from their wonted spawning-grounds just as rainbow trout have been known to drive off brown trout. There is need for direct information on these points, and it can only be obtained from proper observations. Unfortunately, we have insufficient facilities for making such observations, although we may expect some progress in this direction from the recently organized efforts in fresh-water fishery research which are being made in connection with the Acclimatization Societies' Association's scheme. If acclimatization enterprises are to be regarded as anything more than gambling with the forces of nature, the initiation of such enterprises must carry with it more responsibility than has hitherto been recognized — responsibility for the scientific consideration of possible results and the scientific observation of actual results.

Atlantic Salmon.

For the capture of salmon to provide eggs for the hatchery at Te Anau a rack was placed at the usual site in the Upokororo River. In previous years one of the chief difficulties experienced during floods was the undermining of the base of the rack. This season the shingle holding down the foot of the rack on the lower side was enclosed in wire netting to prevent scouring. However, it so happened that the weather was particularly dry, and there was no considerable flood to test the efficacy of this arrangement.

While the rack was being erected a pound net was fixed in the river. The first salmon came into it on the 10th April. The rack was completed on the 17th April. The run of salmon was poor and of shorter duration than usual. Between the 9th July and the 22nd August only seventeen salmon were trapped. The total number of fish taken was 255 (169 males and 86 females). From these 240,000 eggs were collected and laid down in the hatchery at Te Anau. These were handed over to the officers of the Southland Acclimatization Society, at whose hatchery the final stages of incubation were conducted and by whose staff the fry were distributed in the Upokororo and Mararoa Rivers.

Owing to the evident depletion of the stock of this species in Lake Te Anau and the associated rivers, it was decided that more restrictions on the fishing were desirable. Amended regulations were therefore gazetted in September, 1930, which aimed at diminishing the total abstractions of Atlantic salmon, and especially at preserving the recently spent or nearly ripe fish.

The Upokororo River was closed to fishing except for the period from the 19th December to the last day in February, and all other methods except fly fishing were debarred, and a limit of three fish per day was placed on the catch. Boat fishing for Atlantic salmon was prohibited during the month of October.

The fishing season was considerably affected by the unusually wet summer of 1930-31. This rendered certain waters unfishable, or fishable only with difficulty, and diminished the number of anglers who went out. The Southland Acclimatization Society estimates the total number of salmon taken by anglers at Te Anau as between 300 and 400 for the season—a considerable reduction on the previous year's total.

As to the cause of the depletion in the Atlantic salmon stock of Te Anau, there is no doubt but that the two most important factors which have been operating throughout the last eight years have been the taking of eggs for the stocking of the Wanganui River, which unfortunately has produced no apparent results, and the increased attention which has been paid by anglers to this fishing. With rapidly improving transport facilities, the number of anglers visiting Lake Te Anau has increased very considerably from year to year until last season.

With a view to establishing a fresh sea-running stock in the Waiau River system, the project of making a further importation of Atlantic-salmon ova from Britain was proposed by the Southland Acclimatization Society, whose council offered to share half the cost with the Government. It seems likely that good results would be achieved by such an importation, but further consideration of the project has been deferred owing to financial conditions.

Whitebait.

The whitebait season compared unfavourably with that of the previous year. The decline in catch, however, may be attributable rather to the wet, cold, and unfavourable weather than to any reduction in the runs of fish. Statistics of catches in the strict sense of the word are not available, but our returns from the Westland centres are believed to be approximately correct, and are shown below in comparison with those of previous years:—

——	1927.	1928.	1929.	1930.
	Cwt.	Cwt.	Cwt.	Cwt.
Hokitika and neighbourhood ..	925	463	1,319	914
Greymouth and neighbourhood ..	160	100	252	230
Westport and neighbourhood ..	538	600	No return obtained.	200

Generally speaking, the whitebait catches in other parts of the Dominion show a decline. The problem of these fisheries is further discussed in the section of this report dealing with scientific investigations (p. 23).

In my report last year reference was made to Captain Hayes's discovery of the spawning-places of whitebait on the banks of the Manawatu River. During the past year this work has been continued, and the inspections have been extended to other rivers. The details of this work will be referred to later (see p. 24). I must refer here to the practical lesson to which these discoveries point. It is very evident that among the losses which have been caused by civilized man and his works to the stock of *Galaxias attenuatus* in its various stages, including that which is commercially known as whitebait, the destruction of the spawn and the deterioration of natural spawning-places by the presence of grazing animals must hold an important place. Now that this factor is clearly understood it is very desirable that no time should be lost in taking steps to obviate it. It is therefore greatly to be desired that, wherever the spawning-beds of whitebait are known to occur, arrangements should be made to protect these strips of herbage along the river-bank from the access of four-footed animals.

Captain Hayes has further pointed out the possibility of increasing the production of this species by preventing the drying-up or complete drainage of those swamp-pools in which it lives during its pre-adult and adult feeding stages.

SCIENTIFIC INVESTIGATIONS.

Oyster Investigations.

A scientific understanding of the biology of rock-oysters is necessary for the rational exploitation of the existing "fisheries," and also to enable cultivation methods to be developed and carried out to the best advantage. The work that is being done with this end in view consists of (1) direct observation of the naturally occurring oysters and of their environmental conditions, and (2) experimental work in which the effects of different environmental conditions, artificially provided, are studied. The first is a matter of making periodical observations of the natural or established beds, and keeping systematic records of their productivity and varying conditions and of the observable factors which may possibly be correlated with the oyster phenomena. Water-temperature and other conditions depending on location are the environmental factors which would appear to be of most importance.

In Appendix II is given a comparative table of average monthly temperatures taken at three different stations in the Hauraki Gulf and Bay of Islands for the last three years, and at one station in the Kaipara Harbour for the last two years. The records for these particular "stations" are selected out of many because temperatures have been taken there with greater frequency. Each of them is in a rock-oyster area, and the averages represent the conditions, so far as the temperature factor is concerned, by which the oysters in the vicinity are affected. It is not proposed at this stage to make any detailed correlation between temperatures and oyster phenomena, but it may be pointed out that an average temperature of at least 20° C. (60° F.) appears to be necessary before successful spawning can take place. It will be noticed that during the year 1930–31 this temperature was reached in each of the four areas one or two months earlier than in the previous year, and there is evidence of more successful oyster-spatting this year, which may be considered to be a direct effect of this warming-up of the water earlier in the season.

In the Kaipara Harbour there was, as usual, a copious setting of young oysters during the summer of 1930–31. It will be noticed that the water-temperatures in this area are generally appreciably higher than on the eastern side of the province.

Besides making periodical inspections of the established cultivation work, Mr. Young has in hand various experiments with a view to exploring possibilities of developing new methods of cultivation, as well as of eliminating the elements of chance from the cultivation operations already adopted.

Trials of the Australian methods of "tray cultivation," begun in 1929, are being continued. The method consists of taking small or poorly nourished oysters from places where they do not grow into marketable oysters and putting them on trays of wire netting set up where the conditions are suitable for oyster-fattening. The results so far obtained go to show that greatly accelerated growth takes place on the trays, the development of shell being the earliest and most conspicuous effect of the transplantation. Fattening eventually takes place, but it occurs later on the trays than on the natural rocks, and such tray oysters are not ready for sale in the usual marketing season, June–September.

The drawbacks and difficulties to this method appear to be—

(1) Corrosion of the wire and collapse of the frame through attacks of "ship-worm" owing to the long period during which the oysters require to be held.

(2) The tendency for mud to collect under and around the trays, with consequent smothering of the oysters. (Many losses resulted from other causes, some of which might have been prevented if more frequent surveillance had been possible. The main problem is in the location of the sites. It is necessary to keep the trays clear of any channel that may be used by boats; but where there is not a good current of water, or where the flow is appreciably checked by the trays, there is an increased tendency to collect mud.)

(3) The oysters on trays are subject to disturbance by wave-action. This can be minimized by fitting splash-boards on the weather side, and is not a serious difficulty when the oysters can be kept under fairly frequent observation.

As a result of the tray-cultivation experiments so far carried out, the Marine Biologist prescribes the following points as essential to success:—

"(1) Adequate and constant supervision is necessary, so that defects in the tray may be remedied (piling up of oysters due to weather, netting carrying away, provision of splash-boards, &c., picking of oysters as soon as marketable).

(2) The trays must be at very low level—just about 1 ft. above the low-water level of mean spring tides.
(3) Heavy-gauge material, well galvanized, is necessary for the grid of the tray, and the frame and supports must be as teredo-proof as possible.
(4) Oysters must be removed and sold as soon as possible and a fresh crop of poor stuff put on the tray, so as to get as many crops as possible.
(5) Trays must be in deep enough water to ensure that even at their low level there is at least 2 ft. clearance under them. This is a difficult problem in many of our waters, as one cannot block up any fairways with trays, and unless one gets into the fairway it is impossible to get the required working-depths. Manaia is the only place I know where all these conditions prevail."

It is proposed for the time being to concentrate the experimental tray-work at Manaia, as this locality shows most promise of successful results being obtained. The concentration of work at one place will also facilitate more frequent surveillance and observation.

An experiment is being conducted to ascertain the effects of transplanting rock-oysters to a position below the level of low tide.

The conclusion arrived at from experiments in collecting oyster-spat on stakes (which is carried out commercially in Australia for the provision of oysters for fattening on trays) is that success is dependent upon utilizing timber that will retain its bark in salt water for at least three years and at the same time be resistant in teredo (" ship-worm "). All the experimental stakes which we have so far tried have failed to fulfil these requirements. It may be possible to overcome this difficulty by using stakes made of fibro-cement or coated with cement, and it is proposed to try this out on an experimental scale.

An all-important practical consideration with regard to this cultivation work is the question of the cost of material and labour. Due regard to this point is being paid in all the experiments conducted.

The concrete slabs placed at various " stations " early in 1930 to enable more definite observations to be made, both on the natural development and ecology of rock-oysters and on the effects of various cultivational treatments, have been examined periodically. Some interesting records have been made, but it is too early to draw any conclusions at this stage. There are eighty-four of these slabs in the Hauraki Gulf, fifty-four on the Coromandel Beds, forty-eight in the Kaipara, and thirty-six in the Bay of Islands.

Marine Fishes.

Measurements of commercial catches and observations on the food of snapper in continuation of the work done in previous years have been made by Captain Daniel as opportunity offered in the course of his fishery patrols. He has also carried on tow-netting during the spawning seasons of snapper, flounders, and dabs in continuation of his previous work to determine the distribution of the floating eggs of these species. In the course of this work he has found anchovy-eggs occurring in some abundance between Waiheke and Kawau. This is the species the young of which, together with young sardines at the same " post-larval " stage, as mentioned in last year's report, provide a " whitebait " fishery off Northcote, in Auckland Harbour, when the young fish at a size of about 2 in. migrate to shallow waters.

In connection with the study of the flounder and dab fisheries of the Hauraki Gulf Captain Daniel is also making records of the condition with regard to sexual ripeness of fish taken by the fishing-vessels. He has also collected samples of otoliths from flounders and dabs for study by the Marine Biologist with a view to determining the age and growth-rate of these species. These points have an important bearing on the problems of depletion and the question of size-limits.

An interesting variation in the incidence of spawning has been observed in the past year. In 1929 the flounders (*Rhombosolea leporina*) were about a month earlier than the dabs (*Rhombosolea plebeia*) in their spawning, and were mostly spent by the end of September. In 1930 the spawning of the dabs preceded that of the flounders.

Statistics.—Besides conducting the oyster observations and experiments and dealing with the biological material from the Hauraki Gulf fisheries above mentioned, the Marine Biologist, Mr. M. W. Young, has devoted much time to the tabulation and study of statistical material from fishermen's log-books and other commercial returns.

Whitebait Investigations.

During the year Captain Hayes has continued his observations of the spawning of *Galaxias attenuatus* on the Manawatu River, to which reference was made in my last annual report.

We now have a record of continuous observations of the spawning of this species in the Manawatu from March, 1930, till May, 1931. The following are the periods in each month when spawning has taken place, the ova being deposited among the herbage on the banks of the estuary above the level of high water of ordinary tides :—

1930—March 17th and 18th (full moon on 15th) ; April 13th, 14th, and 15th (full moon on 13th) ; April 29th and 30th (new moon on 29th) ; May 13th, 14th, and 15th (full moon on 13th) ; May 29th and 30th (new moon on 28th).

1931—January 8th, 9th, and 10th (full moon on 5th) ; February 6th, 7th, and 8th (full moon on 3rd) ; March, 7th, 8th, and 9th (full moon on 4th) ; April, 5th, 6th, and 7th (full moon on 3rd) ; April 19th and 20th (new moon on 18th) ; May 4th, 5th, and 6th (full moon on 2nd) ; May 19th and 20th (new moon on 18th).

It will be noticed that in relation to the dates of full moon or new moon (or the theoretical dates of the highest tide consequent upon these phases) spawning activities in 1931 were later than in 1930. This is ascribed to the fact that the spring tides of 1931 were higher than average, presumably owing to meteorological conditions.

These observations have subsequently been extended to other whitebait-waters in the Dominion, and spawning-places have been located as follows (number of different spawning grounds in brackets): Waikato River (10); Manawatu River (6); Waimea Stream (2); Waikanae River (2); Makara Stream (1); Hutt River (2); Waiwetu Stream (tributary of Hutt River) (1); Grey River (Punt Lagoon) (1); Arahura River (1); its tributaries, Ritchie's Creek (2) and Dumb Daly's Creek (2); Hokitika River (1), its tributary Mahinapua Creek (2); Ashley River tributaries—Mullins (Salt Water) Creek (2) and Taranaki Creek (1); Waimakariri tributaries—Cam River (2) and Styx River (2); Rakaia River tributaries—Matthias Creek (2) and Boat Creek (2); Porangahau River, Hawke's Bay (1).

Thus forty-eight different spawning-places on thirteen different river-systems have now been located. The water which flows over the different spawning-places shows considerable variation in salinity. On the Waikato it was found to be quite fresh to the taste.

Detailed reports on the various surveys have been written, which will be submitted for printing as a Fisheries Bulletin as soon as they can be prepared for publication.

The interest of the results which have been obtained arises largely from the revelation of a spawning habit which is entirely novel in comparison with all that has been previously known as to the life-histories of New Zealand fishes. Its very real importance, however, has to do with the practical lessons which it provides. Until these practical lessons are realized and acted upon, the material value of the work goes for naught. The observations on the Manawatu in 1931 showed how this habit of *Galaxias attenuatus* in spawning above ordinary high-water mark, while affording protection from its original aquatic enemies, rendered the embryos liable to considerable destruction under the conditions which now prevail. The danger from the trampling of grazing-stock and the annihilation of possible spawning-grounds as the result of grazing have been found to occur on practically all the localities investigated.

Another detrimental factor which has been pointed out as a consequence of European settlement is the occurrence of exotic deciduous trees which render the ground beneath them unsuitable for the herbage which is necessary to afford cover for the spawn. The effect of willows on the banks of streams may also change the contour of the bank and thus prevent it from affording suitable conditions for spawning.

The requisite action for obviating these detrimental conditions is obvious. Known spawning-areas should be fenced off so as to prevent the intrusion of cattle, &c., and the spreading limbs of exotic trees occurring on the sites used as spawning-grounds should be lopped so as to diminish the area of ground subject to injury from this source.

There would be no point in extending the possible spawning-areas for a stock of fish which was too small to make use of such facilities. Captain Hayes has emphasized the desirability of providing sanctuaries or feeding-grounds for the adult fishes. Such feeding-grounds have, of course, been greatly diminished in the course of civilized settlement by the drainage of swamps and lagoons and their conversion into agricultural lands. It would appear, however, that there are in many places areas of swamp which are of little or no value to agriculture, and in which permanent lagoons which would accommodate considerable numbers of inanga might be formed as the result of comparatively simple and inexpensive work.

Quinnat Salmon—Marking Experiment.

An understanding of the migrations of salmon is a question of more than scientific interest; it is a matter of considerable practical importance. The present distribution of quinnat salmon in various New Zealand rivers has come about mainly as a result of natural migration. While little or no result has accrued from attempts at the artificial stocking of such rivers as the Hokitika (west coast of South Island) and Wairau (north-east coast of South Island), all the larger rivers of Canterbury are now invaded by annual runs of these fish from the sea, and their waters are stocked by the progeny produced by natural spawning. The ancestors of all these Canterbury quinnat were undoubtedly the stock which was originally liberated in the Waitaki River system. It is a matter of practical interest to know to what extent this dispersal of quinnat bred in the Waitaki system to other rivers is still taking place. With a view to getting some information on this point, we have marked a number of parr reared in a pond at the Hakataramea Hatchery. The fish were marked by cutting off the adipose and one of the ventral fins, this method of marking having given satisfactory results in the case of quinnat marked at the same stage of growth in certain Californian rivers.

In 1930 smolts to the number of 3,211 were marked by removal of the adipose and right ventral fins; in 1931 a total of 6,042 young fish has been marked by removal of the left ventral and adipose fins. The marked fish were liberated in the Hakataramea River, whence they would find their way to the sea via the Waitaki. The earliest returns from the 1930 experiment may be expected in the fishing season of 1932.

The collection of scales from quinnat salmon for the determination of age is being continued. Casually collected samples have been forwarded by anglers, but more comprehensive collections are being made of scale-samples from the fish trapped for hatchery purposes. There is no one available of the staff of the Department to carry on a comprehensive study of this material, but there is a possibility that Mr. Parrott, Biologist to the Fresh-water Fishery Research Committee of the Acclimatization Societies Association may be able to make the necessary examination for a scientific report.

Atlantic Salmon in Lake Coleridge.

On the 20th November, 1928, forty thousand Atlantic-salmon fry, hatched out in the Christchurch hatchery of the North Canterbury Acclimatization Society from ova supplied by the Department from Te Anau, were liberated in two streams flowing into Lake Coleridge. This is a lake about twelve miles long and two miles wide situated among the hills in the back country about sixty or

seventy miles distant by road from Christchurch. This lake formerly had an outflow into the Harper River, a tributary of the Rakaia River. Since the waters of the lake were "harnessed" for the purpose of the Lake Coleridge hydro-electric scheme (started in 1916) this Harper River outflow has been cut off and the only outlet is by way of the penstocks to the power-station turbines. There is, therefore, no possible access to the lake for any fish returning via the Rakaia River from the sea.

It was on this account that the supply of ova above mentioned was granted to the North Canterbury Acclimatization Society in 1930, in order that an indubitable stock of "landlocked" lake-fed Atlantic salmon might be produced. So far as this Department was concerned, the main object was to enable light to be thrown on the natural history of lake-dwelling salmon in order to assist our understanding of the salmon of Lake Te Anau. All the evidence available goes to show that, in spite of the fact that there is easy access to the sea by way of the Waiau River, the majority of the salmon taken in Lake Te Anau and its tributaries have never been to salt water, but have remained and fed in the lake up to the time of attaining maturity. A small proportion of the Te Anau fish appear, from their difference in coloration, to have come up from the sea, and from time to time salmon have actually been caught at the mouth of the Waiau and in its lower (tidal) reaches. Salmon have also been caught in the Waiau River in its course between Lake Te Anau and Lake Manapouri, the pools of which have become increasingly popular with salmon-fishermen for both minnow and fly fishing. Some of the salmon caught in this part of the river between the two lakes contained food, consisting of insects or small fish, in their stomachs, and were obviously feeding—a condition that is in no way comparable with that of the sea-run salmon taken in British rivers.

Attempts to interpret the history of Te Anau salmon by examination of their scales have not thrown any very definite light on the subject though it is quite possible that a detailed study of representative samples of scales taken from fish caught in the tideway and from the lake respectively would afford a key to the solution of the problem. So far we have been unable to collect sufficient material for this study, and all that can be said for the present is that the scales of all these salmon are in most cases difficult to "read" with any degree of certainty.

With regard to the Lake Coleridge experiment, it was hoped that the capture of some of these 1928 fry at a later stage of growth would provide definite data as to the growth and condition attained in a known time, together with specimens of scales the markings of which could be exactly correlated with known conditions.

The desired data made their appearance at an unexpectedly early date, early in December, 1930—less than two years and one month after the liberation of the fry—when three specimens of Atlantic salmon caught by anglers about the 23rd, 24th, and 30th November, were forwarded to Wellington from Christchurch by Mr. A. W. Parrott, Biologist to the Fresh-water Research Committee, at the instance of the North Canterbury Acclimatization Society. These fish were respectively 22 in., 22½ in., and 23 in. in length, and weighed respectively 3¼ lb., 3 lb., and 3¼ lb. There could be no possible doubt as to their specific identity. In appearance they were typical *Salmo salar* at the grilse stage, though probably more slender in shape than the average European grilse of the same length. In anatomical characters—scale-count, number of gill-rakers, and body-measurements—they conformed to the specific characters of *Salmo salar*. The most remarkable character about them is the exceptional growth and development which have taken place at an age of but little over two years. This is not an effect of being placed in "virgin water," for Lake Coleridge has been stocked with brown trout for many years, though rainbows at present are the dominant game fish, and in recent seasons numerous landlocked quinnat salmon reputed to be of excellent quality and fighting-power have been caught in the lake. These latter have been derived from stock which originally ascended from the sea by way of the Rakaia River before connection with that waterway was cut off by the hydro-electric scheme.

In Britain the majority of young salmon at this age are just about to migrate from the river to the sea, having grown to a length of about 4 in. or 5 in. in the Scottish rivers and 6 in. or 7 in. in the more clement waters of such rivers as the Wye. A small proportion of salmon bred in English rivers reach the smolt stage early and go to sea after completing their first year. These would certainly put on considerable growth as the result of a marine diet in their second year. Nevertheless, a comparison with the estimated lengths, at the end of their first year in the sea, of the salmon of the river Spey which have been exhaustively studied by Menzies and MacFarlane* from scale-samples and measurement data, shows that these Lake Coleridge fish are at least 10 centimetres (4 in.) longer than the average length of Spey salmon which have fed in the sea for a year after migrating as two- or three-year-old smolts. It should be noted, however, that these Scottish fish would begin their first summer's feeding as tiny individuals, the size of a sprat, and the North Sea winter season, with its retarding effect on growth, would be upon them by the time they had attained a size which would enable them to feed upon prey of substantial size.

To what factors can the rapid growth of the Lake Coleridge salmon be ascribed? At present we know practically nothing of the fish-food supplies in this—or, for that matter, any other—lake. The stomachs of trout caught here in summer have been found to contain mainly insects, acquatic and terrestrial. "Water-boatmen" appear to be particularly abundant and caddis-flies are plentiful. Coleoptera, Hymenoptera, and Orthoptera are all represented. The only fish found in nine stomachs examined were bullies (*Gobiomorphus gobioides*). Eels are abundant in the lake, and doubtless those of small size as well as young individuals of the Salmonoid family afford nourishment to trout and salmon. There are also probably plenty of small fishes of the Galaxiid family. But the factor which probably has most to do with the phenomenon is that of temperature. Here again considerably more data are required for the full elucidation of the question. I understand that the winter

* "Salmon of the River Spey": Fisheries, Scotland, Salmon Fish, 1928, Nos. I and III.

temperature of Lake Coleridge water averages 48° F. and the summer temperature 52° F. There is thus very little seasonal variation, and apparently rapid growth continues throughout the year. The structure of the scales of the specimens examined corroborates this. Except that a "parr" nucleus is shown, after which there are indications of a sudden change to conditons making for augmented growth which persists steadily throughout life, the scales present no obvious "zoning" features.

Two checks are indicated early in life—one at a length of 2 in. to 2½ in. and another at a length of 4 in. to 4½ in., which probably represents the winter of 1929 immediately prior to migration from the stream to the lake. There is a slight indication of narrowing at a length of 15 in. to 17½ in., which probably represents the winter of 1930. In the absence of a considerable amount of previous study of the same class of scales, with corroborating circumstantial evidence, it would be very difficult to give a confident "reading" of the age of these fish from their scale characters such as is possible in the case of European salmon. The same remark applies to those of Lake Te Anau, and it seems possible that these fish similarly make more rapid growth than has hitherto been suspected.

With regard to sexual condition, I can only report on two of my specimens, as the reproductive organs of the third had been entirely removed in cleaning the fish. The first of the other two was a male with "milts" 80 mm. (3⅛ in.) long and 8 mm. (about $\frac{7}{20}$ in.) in width at the widest part. This would certainly have reached sexual maturity in time to take part in the spawning activity of the 1931 winter season—*i.e.*, just before attaining the age of three years. The second specimen was a female with ovaries about 55 mm. (2⅛ in.) long by 10 mm. ($\frac{5}{12}$ in.) wide and ova of about 0·75 mm. diameter. It seems probable that this would also have been ready to spawn in its second winter of life. These Lake Coleridge Atlantic salmon thus demonstrate not only an extraordinary growth-rate, but also a precocity in reaching maturity, compared with their European ancestors.

At least a dozen of these Atlantic salmon were caught in Lake Coleridge in November–December, 1930. Scales of a specimen recorded as 24½ in. long and 3¾ lb. weight, caught on the 26th December, 1930, have been forwarded to me by Mr. H. G. Kemp, of Ashburton, and there was a report of the capture of a 5 lb. specimen in the January, 1931, number of the *New Zealand Fishing and Shooting Gazette*. I do not know how much dependence is to be placed on the accuracy of the reported weight in this latter case.

A further question arises: Can this rapid growth be maintained for the third and subsequent years in this lake environment and on a fresh-water diet? I think not. The Te Anau salmon first become mature when they have attained a weight of from 3 lb. to 5 lb. and while they present the grilse-like appearance (forked tail and slender contour lines); and the evidence from scale-examinations and from marking experiments shows that after this they put on very little additional growth, most of the nourishment they ingest apparently being necessary for the development of the reproductive organs.

Fresh-water Research.

The new committee set up by the Acclimatization Societies' Association, as mentioned in my last report, has now completed its first year's work. It had been proposed to employ two biologists, one with headquarters at Wellington and one at Christchurch. However, owing to uncertainty as regards future finance, one biologist only has been appointed—namely, Mr. A. W. Parrott—who has been working at Canterbury College, Christchurch, under the direction of Professor Percival. In connection with trout investigations Mr. Parrott has concentrated on the study of scale-samples from various rivers and lakes in connection with the problems of age and growth. He has completed reports on this subject in connection with the trout of Lake Sumner, the Lake Ellesmere system, the Aparima River, and the Hutt River. He has also completed a report on an investigation on the growth of the scales in relation to the growth of the fish in *Gobiomorphus gobioides* (bully), and he has made a preliminary investigation of the scales of some Atlantic salmon from Lake Te Anau. Professor Percival has organized a scheme for the recording of temperatures of fishing-waters in different parts of the Dominion. He is also collecting evidence with a view to a general report on the question of the deterioration of fishing in certain rivers. He has also accumulated considerable information regarding the life-histories and biology of several aquatic organisms which figure in the food of trout, including the bully (*Gobiomorphus gobioides*), silvery or smelt (*Retropinna retropinna*), and various members of the family Galaxiidae, and a number of invertebrate animals, such as fresh-water shrimp "water-flea," may-flies, caddis-flies, snails, &c. Preliminary investigations on the dissolved gases and mineral salts found in Lake Te Anau have been carried out by Professor Percival, who has also given lectures at seven of the larger centres for the purpose of instructing and interesting anglers in the study of fresh-water life.

In my report for the year 1928–29 reference was made to the investigations on trout problems carried out by Captain J. S. Phillips under the Wellington Acclimatization Society's Fishery Fellowship scheme at Victoria University College, Wellington. At the expiration of the term of this fellowship, and before leaving for England in July, 1930, Captain Phillips submitted another report, which was published by the Marine Department early in 1931 as Fisheries Bulletin No. 3—"A Further Report on Conditions affecting the Well-being of Trout in New Zealand." In addition to these two reports, a paper on "A Revision of the New Zealand Ephemeroptera" was published in the "Transactions of the New Zealand Institute," Vol. 61, Part 2 (1930), as a result of the same author's researches.

I have, &c.,

A. E. Hefford,

Chief Inspector of Fisheries.

The Secretary, Marine Department, Wellington.

APPENDIX I.

LEGISLATION.

The following regulations have been made during the year :—

10th April, 1930 : Prohibiting the taking of mussels for sale from Katikati, Tauranga Harbour.

1st May, 1930 : Imposing conditions and restrictions on the taking of mussels in Whangarei Harbour.

20th November, 1930 : Prohibiting Danish seine nets, Lyttelton Harbour.

18th December, 1930 : Varying close season for oysters in the South, Stewart, and adjacent Islands.

19th February, 1931 : Prescribing forms and fixed periods for making returns of fish caught.

18th September, 1930 : Amending regulations as to licenses to fish for Atlantic salmon (*Salmo salar*) in the Southland Acclimatization District.

21st May, 1931 : Prohibiting wire or gimp trace over 21 gauge or rod over 11 ft. (" stroke hauling ").

16th March, 1931 : Amending regulations imposing conditions and restrictions on the taking of quinnat salmon (*Onchorhynchus tschawytscha*) for purposes of sale.

Regulating fishing for trout and other acclimatized fishes in the following acclimatization districts : 3rd April, 1930, Wellington ; 17th April, 1930, Ashburton ; 17th April, 1930, Nelson ; 17th April, 1930, East Coast ; 5th June, 1930, Lakes District ; 26th June, 1930, Stratford ; 24th July, 1930, Auckland ; 7th August, 1930, Wanganui ; 7th August, 1930, Marlborough ; 11th September, 1930, prohibiting the taking of trout, perch, and tench, in Mataura River (Otago and Southland) ; 2nd October, 1930, Ashburton (amending) ; 16th October, 1930, South Canterbury ; 18th December, 1930, Waitaki (amending) ; 23rd January, 1931, North Canterbury (amending) ; 19th February, 1931, Nelson (amending).

APPENDIX II.

AVERAGE TEMPERATURE OF SEA-WATER (AT THE SURFACE) FOR EACH MONTH OF THE YEAR AT FOUR DIFFERENT STATIONS.

	Auckland Harbour (off Nelson Street Wharf.)			Tamaki Estuary (off Panmure).			Bay of Islands (off Russell).			Kaipara Harbour (Whakapirau Estuary).		
	1928–29.	1929–30.	1930–31.	1928–29.	1929–30.	1930–31.	1928–29.	1929–30.	1930–31.	1928–29.	1929–30.	1930–31.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
May	17·7	14·4	16·2	16·5	15·8	14·2	16·9	16·6	16·7	..	..	14·5
June	..	13·1	13·0	11·2	12·8	11·9	15·3	15·0	14·4	..	..	13·3
July	12·9	12·3	11·1	12·0	10·8	10·3	13·8	11·8	14·5	..	11·9	12·4
August ..	13·9	11·6	11·7	12·8	12·2	11·2	15·2	12·7	14·3	..	11·7	12·3
September ..	13·9	14·0	12·9	14·3	13·6	13·2	15·1	15·0	14·4	..	13·6	14·2
October ..	15·3	15·6	14·1	15·9	15·5	14·8	16·0	17·0	15·5	..	15·4	15·0
November ..	17·2	17·5	15·5	19·1	18·1	16·8	16·0	18·3	16·2	..	17·3	15·7
December ..	19·3	18·8	18·4	20·3	19·0	20·1	19·3	19·2	17·7	..	19·7	20·4
January ..	20·6	18·8	20·4	22·7	19·8	21·0	20·1	19·0	20·8	..	21·1	23·4
February ..	20·2	20·2	20·2	21·2	20·8	20·1	20·3	19·5	19·7	..	21·6	21·2
March.. ..	19·4	20·3	19·5	21·0	20·1	19·3	20·6	20·4	19·1	..	22·0	19·2
April	17·1	18·4	17·6	17·4	17·4	17·1	19·0	19·0	17·6	..	19·4	19·0

MARINE FISHERIES INVESTIGATION STATION.

SIR,—

I have the honour to submit the report of the Portobello Marine Investigation Station for the year ending 31st March, 1931.

At the date of the last annual report Mr. David H. Graham had been acting as biologist for three months, and was very active and enthusiastic in his work. Unfortunately, in June he met with an accident to his left knee while out collecting, and, not realizing at first the risk he ran, he continued his work until lameness compelled him to lie up. Medical examination showed that prolonged rest, and ultimately one or two operations, were required to restore him to his work, but under restricted conditions, and his lameness has seriously handicapped him. In spite of this unfortunate accident he has accomplished a considerable amount of work, which is detailed in the course of this report.

EUROPEAN LOBSTERS.

The stock of lobsters in the ponds now consists of fifteen males and fourteen females; two—a male and a female—died from injuries received during the year. When examined early in November twelve females were found to be carrying full batches of eggs. These began to hatch out early in December, and the last lot were hatched in the latter part of January. It is estimated that about 200,000 larvæ were liberated.

It may be remembered that during the 1908–9 season the late Mr. Anderton made an attempt to rear young lobsters in the tanks and Macdonald jars. Out of 3,000 larvæ placed in these receptacles only twelve survived at the end of five months. Young lobsters from their first to their fourth stage —a period of about twenty-two days—moult every five days on the average, and when newly moulted they are liable to be at once attacked and eaten by their fellows, as they are soft and quite unable to defend themselves. When eight months had elapsed only six were alive, at twelve months only three, and at seventeen months only one. This little lobster continued to live in the tanks till it was four years and four months old, which is easily a record for tank-reared lobsters. It apparently died in one of its moulting efforts.

Mr. Graham renewed the attempt to rear young lobsters in captivity, and for this purpose had fifty boxes made and fitted into larger tank boxes, and the whole connected with the main water-supply of the station. About 170 larvæ were obtained and were divided among the compartment boxes. These were fed with macerated cockles and plankton. Unfortunately, a rusty pipe had been fitted into the supply, and this was only discovered when the fine netting in the boxes was found to be badly choked with rust. The supply was at once changed and brought by rubber hose direct from the reservoir, but the mischief had been done, the larvæ began to die, and eventually only one survived. This little lobster is still alive and active at the time of writing this report. It is evident that larvæ liberated direct from the ponds have to run the gauntlet of great numbers of small fish (mullet, sprats, kokopuru, &c.) before they reach the stage at which they sink to the bottom of the sea. At the same time, to rear them in any quantity at the station would require a larger staff than is available, as the amount of undivided attention required in feeding and cleaning is very great.

The adult lobsters in the open tanks at the station suffer from the muddy bottom and from the abnormal growth of algæ due to the shallow water and its exposure to strong light. Mr. Graham had several gravid females moved to the wharf pond, which has a concrete bottom and is comparatively shaded. These appear to be much freer from weed, and to carry larger and cleaner batches of eggs.

HYDROGRAPHIC WORK.

The collection of water-samples for salinity tests, and the recording of temperatures of air, pond, bay, and ocean were regularly carried on throughout the year, the three former daily and the latter on every possible occasion. Mr. Scofield, who was transferred from Cape Saunders to Puysegur Point Lighthouse last year, has continued to collect water-samples regularly. These, together with those from the station are sent direct to the Government Analyst's office in Dunedin, and the results are duly recorded. The whole of this work, which in time can be increased indefinitely, is essential for the future scientific development of the fisheries of this Dominion. Meanwhile the taking and keeping of the records is continuous, but the results can only be developed in the future when sufficient material has been obtained.

BIOLOGICAL WORK.

Shortly after his appointment Mr. Graham commenced the establishment of a reference collection of the zoological life of the harbour and the adjacent sea, with special reference to its bearing on fishery problems.

Observations have been made on some eighty species of fishes, of which sixty-seven either are preserved in stock or have been collected and examined. Some of them are rare—*e.g.*, *Eleotris radiata* Quoy and Gaimard, and *Tripterygium segmentatum* McCulloch and Phillipps; while *Notothenia purpuriceps* Richard is new to New Zealand seas. *Auchenoceros punctatus*, found in the stomach of a red cod, is a new record for Otago. The identifications were made by Mr. Graham himself, except for a few small specimens which were reported on by Mr. L. T. Griffin, of the Auckland Museum. Observations and information obtained from fishermen have been recorded for future reference.

Over one hundred species of mollusca have been collected, and these were identified by Mr. A. W. Powell, Conchologist to the Auckland Museum. In addition, observations on the spawning of several nudibranchs have been obtained.

Of the other material collected, Professor Benham has identified all annelids, holothurians, echinoderms, and several other invertebrates. Sea-anemones were identified by Mr. Stuckey, late Chief Inspector of Schools for Otago, and crabs by Mr. C. W. Bennett, of the University of Western Australia, Perth.

Dredging.—The station launch is fitted with a dredge suitable for the collection of scientific specimens, but not for working the bottom in the manner required for economic dredging. With this apparatus it is possible to work down to a depth of 70 fathoms. A chart has been prepared by Mr. Adams which shows with approximate accuracy the ocean contour outside of Otago Heads. During the past twelve months a good deal of dredging has been carried on within this area—that is, to a distance from about twelve miles to the north-east of the Heads to a line abreast of Cape Saunders, and extending in some cases to the 70-fathom line.

Occurrence of Oysters.—One object of this dredging was to locate, as far as possible, the occurrence of mud-oysters (*Ostrea angasi* Sowerby) within the area. There are two distinct and apparently separate occurrences. In working the dredge from 10 to 70 fathoms oysters were only met with in about 50 fathoms, and from that down to the 70-fathom line they were fairly commonly met with, the average size of the shells being about 3 in. in diameter. Between 10 and 50 fathoms very few oysters have been met with, nor have the empty shells been picked up in that area by the trawl-net, which, of course, only skims along the surface of the sea-bottom. With an ordinary deep-sea oyster-dredge Mr. Adams considers that very considerable hauls of oysters could be secured, but whether it would be an economic proposition to lift them from a depth of 50–70 fathoms is open to question.

Singularly enough, just inside the inlet of Wickliffe Bay and at the southern end of the Bay are several good beds of oysters, which are about the same size as those dredged from 60 fathoms, but the shells are neither so thin nor so brittle as those taken in the deep water.

The southern rock-oyster (*Ostrea tatei* Suter), which was formerly very abundant in Otago Harbour, is still found in immense quantities on unfrequented rocky shores along the Otago coast, but especially round Stewart Island and in the West Coast sounds and fiords. The mature shell is comparatively thin and free from the massive corrugations which characterize the northern rock-oyster (*O. glomerata* Gould), and is rather less in diameter, but the animal is just about as large and is quite as delicate as its northern congener. It is only the occurrence of the large Stewart Island oyster, and its relatively easy collection, which have obscured the excellent qualities of the smaller species. The life-history of this oyster was roughly worked out at this station a few years ago. The animal comes to maturity within three years of the deposition of the spat, and the ponds at this station are now lined with numbers of them between tide-marks.

Pipis.—Attention is drawn to the occurrence of great quantities of pipis (*Amphidesma forsteriana* Finlay) both within and outside Otago Harbour. They occur in abundance on the sandbanks off the Kaik, which are partially bare at low water. When working the trawl at the Heads and outside within the 10-fathom line the empty shells are picked up by the net in great quantity; but when the dredge is used, even at the shallow depth in the sand at which it works, the live animals are frequently brought up. A large oyster-dredge would lift great numbers, but the animals bury themselves rapidly when disturbed.

No use at present is made of this valuable food-supply, and very little is done with either cockles or mussels, which are equally abundant in the estuaries and round the coast. There is a constant outcry about the cost of living, but natural sources of good food are lying at our doors unutilized.

The work of outlining and noting the occurrence of oyster-beds and of pipis was carried out by Mr. Adams, assisted by Mr. Broadley.

Algæ.—Mr. R. M. Laing, of Christchurch, has long been in touch with the station, and has recently received material from it for the continued study of algæ. In a brief report to the Chairman of the Board he stresses the importance of the Portobello Station as admirably situated for the study of seasonal changes in the seaweed crops, both in harbour algological formations and in those of the open coast. Though the seaweeds are of low food value, and are never likely to be made use of as food in this country, as contrasted with Japan, where some seventy or eighty kinds are employed in various ways, yet they are of importance medically as a source of iodine compounds for the prevention of goitre, and as a makeweight in diabetes. He also stresses the occurrence on our coasts of immense quantities of seaweeds belonging to the genera *Gigartina*, *Gracilaria*, and other genera, which supply an excellent and readily extracted jelly. He adds that the Portobello Station would be a suitable centre for the investigation of this source of food-supply, and might well help in the beginning of an industry.

Food of Fishes.—The examination of the stomach contents of fishes, so well carried out in the earlier years of the station's activities by its first curator, the late Mr. T. Anderton, has been continued and extended by Mr. Graham. The total number of species examined by him was forty-five. The notes and records, which are added in an appendix, are in addition to those already recorded in the bulletin of the station published in 1921.

Seine netting was carried out whenever possible by Messrs. Adams and Broadley on the banks at Lower Portobello and the Upper Harbour. The set-net was also put down at frequent intervals during the summer months in the deep-water channels of the harbour, and off the coast from Hayward's Point to Purakanui Inlet. Owing to the migration of many species of fish from the shallow waters of the harbour to the much warmer water outside, the set-net is not utilized from May to November.

Weather and its Effect on Fish.—Mr. Adams reports as follows:—

"The early part of the winter of 1930 was extremely mild, but towards the latter part of June exceptionally stormy weather set in and continued right through July. As a result of the sudden change the temperature of the pond water quickly dropped to 3·2 C. The lowest temperature of the ponds recorded during June of the previous year was 6·4° C. A few moki and blue cod that had not

been moved from the outside ponds soon succumbed to the sudden change. As the heater was in commission, the fish in the observation-tanks were not affected. A number of sea-slugs, however, that had recently been collected on the outside beaches died, no doubt from the effects of the low temperature, though the tank water was several degrees warmer than the harbour water.

"Trawling and dredging were carried out on most of the grounds within ten miles of Otago Heads. In accordance with instructions received from Mr. Howes, all work carried out with the launch off the coast was confined to a limit of ten miles off the Heads. This restriction" [due to the terms of the insurance policy on the launch] "somewhat hampers the work outside the Heads. For a number of years groper have been very scarce within this limit, while blue cod, although frequently plentiful off Cape Saunders, are often only to be caught on the reefs a few miles farther south. The catches of flat fish throughout the spawning season were somewhat similar to those of the previous year. Owing to the weather during July being mostly unsettled, little trawling was done. Although August was more settled, all kinds of flat fish were far from plentiful until the latter part of the month. The fish were then working closer inshore and fair hauls were made. By this time the majority of the fish had spawned. During the final week in September we caught only two flat fish, both flounders which had not spawned.

"Whale-feed (*Munida gregaria*) was again exceptionally scarce throughout the year. It was only for a few days during January that any number was seen by us on the surface inside the harbour. The adult form was seldom taken from the stomachs of fish caught by hand line or trawl. Last year was considered a very poor season for whale-feed, but this year has been worse."

Biological material has been supplied during the year to teaching institutions and to various individuals engaged in scientific research. These include—

Professor Benham (Dunedin)—Annelids, Echinoderms, and Salpidae.
Mr. Bennet (Perth, W.A.)—Thirty-three species of crabs.
Mr. R. M. Laing (Christchurch)—Algæ.
Mr. A. W. Parrott (Christchurch)—*Diplocrepis*.
Professor Percival (Christchurch)—Asteroids.
Mr. A. W. Powell (Auckland)—Gastropods and Nudibranchs.
Dr. H. M. Watt (Dunedin)—Diatomaceous material and Foraminifera.

The Board is greatly indebted to Mr. W. G. Howes, its honorary secretary and treasurer, for the time and attention he has given, not only to the upkeep of the station, but also to assisting Messrs. Adams and Broadley in the work of collecting and preserving material during Mr. Graham's long absences in hospital.

Educational Work.

The station was visited by a large number of persons during the year, particularly by teachers, students, and school pupils. Fishermen also come with specimens, and to receive hints as to their material. These have been shown round by Mr. Graham whenever he was on duty, and have received much instruction and encouragement from him. This is an important part of the work of the station. These visitors included the Dunedin Field Naturalists' Club, the Tramping Club, the Camera Club, Boy Scouts, students of the Training College (who came down in parties of twenty-five to fifty under the supervision of Mr. McCaskill, their enthusiastic instructor), pupils of the Otago Girls' High School, Archerfield School, Port Chalmers District High School, Portobello and Lower Portobello Schools.

On the 7th January the station was honoured by a visit from Their Excellencies the Governor-General and Lady Bledisloe, who expressed their appreciation of the work done by the Board and the staff.

General Work.

Mr. Adams reports as follows: "The launch was placed on the slip at regular intervals for cleaning and painting; the hull and all the trawling-gear are in good condition. The dinghy has now been in constant use almost every day since the station was opened, and is becoming tender on the bottom planks; part of the keel, in which the borer was found, was taken out and renewed, and a brass keel-band fitted. A new wooden valve-box was made and fitted to the suction-pipe connected to the motor-driven pump. Twenty feet of the 4 in. pipe was also renewed. During the winter months, when few people visited the station, the observation-tanks were emptied in turn, in order that the iron frames could be cleaned of rust and painted."

Mr. Broadley twice paid a visit of inspection to the fishing-stations from Oamaru to Waikawa. He has also visited the Dunedin Fish-market regularly.

A monthly weather report was sent to the Director of the Meteorological Department.

I have, &c.,
Geo. M. Thomson,
Chairman of the Board.

The Hon. the Minister of Marine, Wellington.

APPENDIX.

Notes on and Records of Contents of Fish-stomachs, supplementary to those already recorded in the Bulletin of the Station.

(1) Thresher (*Alopias vulpinus*): One specimen, a male, was examined and was full of pilchards.

(2) Smooth-hound (*Mustelus antarcticus*): Contained the following species of worms; *Glycera ovigera*, *Lumbriconereis sphaericephala*, *Aphrodite talpa*, *Nereis vallata*, *Trochodota dunedinensis*, *Physcosoma annulata*, *Hemipodus simplex*, *Chilonereis pereispe*, and *Harmothoe praeclarox*; also *Cucumaria* sp. Young specimens were found to be feeding principally on isopods (Sphaeromidae) and Mollusca (*Maorimactra ordinaria* and *Zeathalia zealandiae*).

(3) Spined dogfish (*Squalus fernandinus*): On two occasions only were fish met with—viz., sand-flounders (*Rhombosolea plebeia*) in Blueskin Bay, and mullet (*Agonostomus forsteri*) in Lower Portobello Bay.

(4) Skate (*Raja nasuta*): Some contained large quantities of lemon soles (*Pelotretis flavilatus*) up to 7 in. in length; others contained red cod 7 in. long; also one mollusc (*Zenatia acinaces*) and worms (*Glycera* and *Physalidonotus*(?) *squamosus*). In young skate *Zeathalia* and isopods were found.

(5) Elephant-fish (*Callorhynchus milii*): In addition to forms already recorded, this fish was found to feed on lemon soles and red cod; the following molluscs—*Myllitella virens*, *Antisolarium egenum*, *Maorimactra*, *Nucula nitidula*, *Turbonilla zelandica*, *Notolepton sanguinea*, *Tellina alba*, *Amphidesma australis*, *Gari stangeri*, *Solemya parkinsoni*, *Tawera spissa*, and *Notosetia* sp.; *Halicarcinus planatus* and *Munida* among crustaceans; broken sea-urchins; *Salpa* sp., and remains of jelly-fish.

(6) Silverside (*Argentina elongata*): Contained the crab *Cyclograpsus lavauxii* and *Munida*; *Glycera ovigera* and unidentified remains of some small fish.

(7) Sea-horse (*Hippocampus abdominalis*): Minute mollusca (*Micrelenchus dilatatus*) and young of *Melaraphe cincta*; undetermined species of amphipods.

(8) *Pseudophycis breviusculus*: Only three specimens were examined, and found to contain *Tripterygion varium*, the common crab (*Cancer novae-zealandiae*), and remains of shrimps.

(9) *Cyttus australis*: Minute undetermined crustaceans.

(10) Sand-eel (*Gonorhynchus gonorhynchus*): Only two specimens were examined. One was found to be feeding on minute crustaceans, the other on brittle-stars (*Ophiomyxa brevirima*).

(11) Garfish (*Hemirhamphus intermedius*): Found to be feeding on worms (*Harmothoea spinosa*, *Amphitrite vigentipes*, and species of *Eunice*) and small crustacea.

(12) Red cod (*Physiculus bacchus*): From stomachs of this omnivorous species the following fishes were taken in addition to those previously recorded: *Auchenoceros punctatus*, witch or megrim (*Caulopsetta scapha*), sand-flounder, kokopuru, *Helicogramma medium*, and *Cantherines scaber*. Of Mollusca, *Micrelenchus*, *Melagraphia zellaria*, *Turitella rosea*, *Tawera*, some octopods and squids; the tunicate *Boltenia*; of Crustacea, *Petrocheles spinosus*, *Nectocarcinus antarcticus*, *Paramithrax minor*, Hymenosomidae, *Munida* (both swimming and adult forms), and crayfish (*Jasus lalandii*). Some red cod caught in Blueskin Bay contained nothing but shrimps (*Pontophilus australis*), one specimen was full of zoophytes(?), another contained a petrel.

(13) *Auchenoceros punctatus*: These were taken from the stomach of a red cod, and had been feeding on crustacean zooeas.

(14) Megrim (*Caulopsetta scapha*): Contained young red cod and sprats, crabs (*Cancer*, *Nectocarcinus*, *Halicarcinus*, and hymenosomids), and *Munida*; brittle-stars (*Ophiomyxa*); holothurians (probably *Chirodota*); and worms (*Glycera* and *Physalidonotus*) and worm-cases.

(15) Brill (*Colistium guntheri*): The favourite food was crustaceans (*Nectocarcinus*, *Halicarcinus*, *Munida*, and *Hymenosoma*); molluscs (*Maorimactra*, *Zeathalia*, and *Nucula*); worms (*Glycera*, *Physalidonotus*), and remains of *Pontobdella*(?). In one catch the stomachs contained nothing but young red cod.

(16) Sand-flounder (*Rhombosolea plebeia*): No fish have been found in those examined; the molluscs were *Maorimactra*, *Antisolarium*, *Myllitella*, *Nucula*, *Zeathalia*, *Calliostoma punctulatum*, *Zenatia*, and *Gari*; the crustaceans, *Halicarcinus*, *Nectocarcinus*, *Petrolisthes*, *Paramithrax*, *Squilla* sp., and small unidentified species; worms (*Glycera*, *Eunice*, *Lepidonotus polychroma*, and *Nereis*); remains of a sea-mouse (*Aphrodite* sp.); and species of Foraminifera.

(17) Greenback flounder (*Rhombosolea tapirina*): Only two specimens were examined, and these contained small mullets (*Agonostomus*), together with mollusca (*Nucula*, *Zeathalia*, *Amphidesma*, *Chione*) and species of Nemertines.

(18) Common sole (*Peltorhamphus novae-zealandiae*): The only fish found in the stomachs were sprats. The molluscs were *Maorimactra*, *Myllitella*, *Paphirus largillierti*, and *Zymene plebeius*; brittle-stars (*Ophiomyxa*); and crustacea (Hymenosomids and small unidentified forms).

(19) Lemon sole (*Pelotretis flavilatus*): In one haul of these fish the stomachs were crammed with young red cod; others contained molluscs (*Maorimactra*, *Chione*, *Zeathalia*, and *Zegalus tenuis*), a Brachiopod (*Terebratella*), crabs (*Paramithrax* and *Hymenosma* sp.), holothurians unidentified, and worms (*Glycera*, *Lepidonotus*, *Timatete anchylochar*, and *Nereis*).

(20) Mullet (*Agonostomus forsteri*) contained young of *Chione*, ostracods, and other minute crustaceans, while some stomachs were full of *Ulva*.

(21) Hapuka, or groper (*Polyprion oxygeneios*): Lemon soles were found in the stomachs..

(22) Trevally (*Longirostrum platessa*): Several were crammed with worms (*Glycera*, *Timarete*, and *Eunice*); others contained *Munida* and a species of shrimp; others the molluscs *Maorimactra* and *Zeathalia*.

(23) Kahawai (*Arripis trutta*): Only three specimens were examined, and these contained sprats and *Munida*.

(24) Snapper (*Pagrosomus auratus*): The only one examined contained the crab *Nectocarcinus*.

(25) Trumpeter (*Latris lineata*): One contained *Nectocarcinus*.

(26) Tarakihi (*Dactylosparus macropterus*): These contained crabs (*Cyclograpsus*, *Halicarcinus*, and *Hymenosoma*), molluscs (*Chione*, *Muorimactra*, and *Calliostoma*), and the worms *Lepidonotus* and *Glycera*.

(27) Moki (*Latridopsis ciliaris*): One specimen contained sprats; others had crustaceans (*Cancer*, *Nectocarcinus*, *Halicarcinus*, *Hymenosoma*, and *Hippolyte bifidirostris*) and ostracodes, and numerous molluscs (*Turbonilla*, *Micrelenchus*, *Notosetea*, *Paphirus*, *Dardanula limbata*, and *Subonola foveauxiana*).

(28) Kelp-fish or Butter-fish (*Coridodax pullus*): During the summer months *Munida* was found in the stomachs, together with the worms *Eulalia* and *Nereis* and the molluscs *Micrelenchus*, which last was perhaps taken with the seaweed, which is their principal food.

(29) Scarlet parrot-fish (*Pseudolabrus coccineus*): Contained *Ulva* and *Micrelenchus*.

(30) Spotty (*Pseudolabrus celidotus*): Many contained small amphipods, isopods, and ostracods. Some were feeding on *Harmothea*; one had only *Dardanula*, and one the brachipod *Terebratella*.

(31) Girdled parrot-fish (*Pseudolabrus cinctus*): Several contained seaweed; others had *Amphidesma Chione*, and *Eulalia*.

(32) Frost-fish (*Lepidopus caudatus*): One specimen was examined and the stomach was found to be empty.

(33) Barracouta (*Thyrsites atun*): Specimens of the sea-perch (*Helicolenus percoides*) and the swimming crab (*Nectocarcinus*) were found, in addition to other species previously recorded.

(34) *Acanthoclinus quadridactylus*: Feeding on *Petrolisthes*, and worms too disintegrated to identify.

(35, 36) Kokopuru (*Tripterygion tripenne* and *T. varium*): The stomachs of both species contained minute crustacea.

(37) Blue cod (*Percis colias*): Besides species already recorded, these contained *Helicogramma medium* and pig-fish (*Congiopodus*), *Munida*, and the molluscs *Mytilus maorianus* and *Chlamys celeator*.

(38) Maori chief (*Notothenia macrocephala*): Only a few were examined, and these contained small flounders (*Rhombosolea plebeia*).

(39) *Bovichthys variegatus*: Contained partly digested worms (*Eulalia*).

(40) Ling (*Genypterus blacodes*): In addition to the fish-food already recorded, these were found to be feeding on sand-flounders up to 7 in. in length, and young barracouta, crabs (*Hymenosoma* sp.), molluscs (*Zeathalia*), and brittle-stars (*Ophyxima*).

(41) Sea-perch, or soldier (*Helicolenus percoides*): The stomachs contained young fish of their own species, pig-fish, and sprats; also crustacea (*Palaemon affinis*, *Squilla* sp.), *Paramithrax*, *Cancer*, *Nectocarcinus*, *Hymenicus*, *and Halicarcinus*), with some amphipods and isopods; and worms (*Aphrodite*, *Glycera*, and *Nereis*).

(42) Pig-fish (*Congiopodus leucopoecilus*): A number of these were found to contain only the worm *Zeathalia*. Others had crabs (*Nectocarcinus*, and *Hymenosoma*), some amphipods and isopods; also worms (*Antisolarium* and *Cantharidella*).

(43) Toad-fish (*Neophrynichthys latus*): Only three contained sand-flounders and soles.

(44) Gurnard (*Chelidonichthys kumu*): Only three specimens were examined, and found to be feeding on crabs (*Nectocarcinus*).

(45) Sucker (*Diplocrepis puniceus*): Contained porcelain crabs (*Petrolisthes*), immature crabs, and other small crustaceans, and worms (*Eulalia*).

(46) Leather-jacket (*Pseudomonacanthus scaber*): Feeding on amphipods, isopods, and unidentified worms.

TABLES.

STATEMENT OF REVENUE AND EXPENDITURE FOR THE YEAR ENDED 31ST MARCH, 1931, IN COMPARISON WITH THE TWO PREVIOUS YEARS.

Revenue.

Item.	1928-29.	1929-30.	1930-31.
	£ s. d.	£ s. d.	£ s. d.
Shipping Branch—			
Light dues	80,979 13 11	82,710 19 6	84,062 0 5
Engagement and discharge of seamen, &c.	2,583 2 9	2,614 3 0	2,235 3 6
Survey of ships	5,123 8 6	5,037 12 6	4,184 18 11
Examination fees, &c.	268 8 0	296 5 0	367 1 0
Sale of charts, books, and forms	1,121 16 10	1,164 9 10	1,057 4 11
Sale of "New Zealand Nautical Almanac"	149 15 5	133 6 2	121 18 8
Miscellaneous receipts	473 17 1	938 8 2	557 11 6
Harbours—			
Port dues, &c.	1,998 18 5	2,206 1 4	1,431 17 4
Foreshore revenue	5,582 0 5	4,817 17 9	4,559 17 3
Inspection of machinery—			
Inspection fees	19,912 11 4	20,725 8 8	22,460 15 11
Examination fees, &c.	402 5 0	369 7 0	384 17 6
Miscellaneous receipts	9 18 0	65 6 1	75 0 5
Fisheries—			
Net profit from sale of oysters	1,160 0 11	1,850 3 4	1,392 6 3
Fishing-boat license fees, &c.	542 0 6	668 3 8	638 15 10
Rental of toheroa areas	300 0 0	300 0 0	300 0 0
Government steamers—Fares, freights, &c.	4,046 7 3	1,733 2 6	1,213 3 9
Ross Dependency—Royalties on whale-oil, &c.	13,961 17 6	7,871 5 0	2 10 0
Miscellaneous revenue	41 6 4	15 11 4	14 8 10
Totals, general accounts	138,657 8 2	133,517 10 10	125,059 12 0
Westport Harbour Account	64,214 5 6	66,274 17 3	53,013 2 11
Totals	202,871 13 8	199,792 8 1	178,072 14 11

Expenditure.

Branch.	1928-29.	1929-30.	1930-31.
	£ s. d.	£ s. d.	£ s. d.
Head Office	9,397 4 4	9,273 9 10	9,708 14 1
Harbours	4,059 18 4	3,846 14 8	3,225 6 7
Lighthouses	23,919 13 11	26,793 14 5	23,691 3 4
Mercantile marine	25,266 9 2	27,142 19 10	27,373 3 1
Inspection of machinery	21,573 2 7	21,957 5 10	24,652 11 7
Fisheries	3,281 12 10	3,727 1 2	3,147 16 11
Government steamers	21,559 12 3	20,820 19 5	21,257 3 11
Miscellaneous services	2,146 4 0	361 19 4	130 10 8
Grants and subsidies	260 0 0	1,350 0 0	175 0 0
Depreciation	9,662 2 8	9,748 17 5	9,806 11 5
Interest on capital	17,285 17 5	17,434 15 2	18,256 11 2
Totals, general accounts	138,411 17 6	142,457 17 1	141,424 12 9
Westport Harbour Account	68,871 13 0	64,877 10 5	53,436 16 9
Totals	207,283 10 6	207,335 7 6	194,861 9 6

N.B.—The figures quoted for 1930-31 are subject to audit.

TABLE SHOWING THE NUMBER OF SEAMEN ENGAGED AND DISCHARGED IN NEW ZEALAND, AND THE FEES RECEIVED, FOR THE YEAR ENDED 31ST MARCH, 1931.

Port.	Engagements and Discharges, Foreign and Intercolonial Trade.				Engagements and Discharges, Home Trade.				Total Engagements.		Total Discharges.		Grand Totals.	
	Engagements.		Discharges.		Engagements.		Discharges.							
	Number.	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.
		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.
Auckland	2,131	206 10 0	2,381	230 16 0	1,475	127 5 0	1,479	127 14 0	3,606	333 15 0	3,860	358 10 0	7,466	692 5 0
Dunedin	741	65 13 0	765	67 12 0	274	24 8 0	356	32 10 0	1,015	90 1 0	1,121	100 2 0	2,136	190 3 0
Gisborne	..	..	..	..	188	12 8 0	218	14 19 0	188	12 8 0	218	14 19 0	406	27 7 0
Greymouth	17	1 10 0	17	1 10 0	57	4 18 0	65	5 14 0	74	6 8 0	82	7 4 0	156	13 12 0
Hokianga	..	..	..	..	1	0 2 0	1	0 2 0	1	0 2 0	1	0 2 0	2	0 4 0
Invercargill	23	2 6 0	18	1 16 0	52	2 7 0	89	6 12 0	75	4 13 0	107	8 8 0	182	13 1 0
Kaipara	..	..	1	0 2 0	..	..	..	..	..	..	1	0 2 0	1	0 2 0
Lyttelton	234	22 12 0	255	24 18 0	745	56 19 0	724	59 14 0	979	79 11 0	979	84 12 0	1,958	164 3 0
Napier	13	1 8 0	13	1 6 0	135	10 6 0	128	10 19 0	148	11 14 0	141	12 5 0	289	23 19 0
Nelson	5	0 10 0	10	1 0 0	487	40 11 0	554	42 4 0	492	41 1 0	564	43 4 0	1,056	84 5 0
New Plymouth	12	1 4 0	10	1 0 0	6	0 12 0	6	0 12 0	18	1 16 0	16	1 12 0	34	3 8 0
Oamaru	..	..	..	..	20	2 0 0	19	1 18 0	20	2 0 0	19	1 18 0	39	3 18 0
Onehunga	..	..	..	..	196	17 1 0	208	17 3 0	196	17 1 0	208	17 3 0	404	34 4 0
Patea	..	..	..	..	6	1 2 0	6	1 2 0	6	1 2 0	6	1 2 0	12	2 4 0
Tauranga	..	..	..	..	4	0 8 0	3	0 6 0	4	0 8 0	3	0 6 0	7	0 14 0
Timaru	4	0 8 0	4	0 8 0	32	2 13 0	23	2 15 0	36	3 1 0	27	3 3 0	63	6 4 0
Wairau	..	..	1	0 2 0	78	3 19 0	75	3 11 0	78	3 19 0	76	3 13 0	154	7 12 0
Wanganui	2	0 4 0	3	0 6 0	41	2 13 0	57	4 0 0	43	2 17 0	60	4 6 0	103	7 3 0
Wellington	3,223	294 5 0	3,069	276 4 0	1,977	166 7 0	2,087	176 18 0	5,200	460 12 0	5,156	453 2 0	10,356	913 14 0
Westport	24	2 8 0	19	1 18 0	32	2 19 0	33	3 1 0	56	5 7 0	52	4 19 0	108	10 6 0
Totals	6,429	598 18 0	6,566	608 18 0	5,806	478 18 0	6,131	511 14 0	12,235	1,077 16 0	12,697	1,120 12 0	24,932	2,198 8 0

TABLE SHOWING TOTAL COST OF MAINTENANCE (EXCLUDING INTEREST ON CAPITAL AND DEPRECIATION) OF NEW ZEALAND COASTAL LIGHTHOUSES FOR THE YEAR ENDED 31ST MARCH, 1931.

Name of Lighthouse.	Salaries and Wages.	Oil consumed.		Stores and Maintenance.	Totals.
		Gallons.	Value.		
	£ s. d.		£ s. d.	£ s. d.	£ s. d.
Akaroa Head	457 3 9	774	53 9 8	173 8 9	684 2 2
Brothers	857 15 7	848	58 11 1	449 11 0	1,365 17 8
Cape Brett	727 18 9	704	48 12 5	398 19 0	1,175 10 2
Cape Campbell	493 4 1	622	42 19 0	260 18 8	797 1 9
Cape Maria	772 15 5	865	62 4 8	313 4 10	1,148 4 11
Cape Palliser	504 5 8	657	45 7 2	194 16 2	744 9 0
Cape Saunders	529 5 8	757	52 5 10	165 13 7	747 5 1
Castlepoint	516 6 8	660	45 10 4	130 0 4	691 17 4
Centre Island	722 8 6	720	49 14 10	206 1 1	978 4 5
Cuvier Island	704 16 1	745	51 8 11	336 4 1	1,092 9 1
Dog Island	554 4 5	748	51 13 4	162 0 0	767 17 9
East Cape	523 16 11	795	54 16 10	192 4 6	770 18 3
Farewell Spit	712 4 1	914	63 2 10	369 2 6	1,144 9 5
French Pass	224 11 9	132	9 1 5	88 3 2	321 16 4
Godley Head	516 0 0	896	61 17 2	258 16 6	836 13 8
Kaipara Heads	769 0 4	740	51 2 1	242 13 2	1,062 15 7
Moeraki	492 14 7	734	50 13 4	78 9 2	621 17 1
Moko Hinou	672 14 3	682	47 2 5	233 10 4	953 7 0
Nugget Point	475 3 1	779	53 16 8	305 10 3	834 10
Pencarrow Head	496 15 10	702	48 8 11	98 4 11	643 9 8
Portland Island	717 16 3	828	57 3 3	268 11 4	1,043 10 10
Puysegur Point	755 0 6	748	51 12 9	149 8 1	956 1 4
Stephen Island	758 3 11	732	50 10 10	279 1 1	1,087 15 10
Tory Channel	..	5	0 12 1	1 3 9	1 15 10
Waipapapa Point	497 17 10	664	45 16 4	148 0 5	691 14 7
Fog-signals	..	..	..	173 15 7	173 15 7
Automatic lights	..	..	..	2,353 13 0	2,353 13 0
Totals	14,452 3 11	17,451	1,210 15 6	8,028 3 11	23,691 3 4

RETURN OF ESTATES OF DECEASED SEAMEN RECEIVED AND ADMINISTERED IN PURSUANCE OF THE PROVISIONS OF THE SHIPPING AND SEAMEN ACT, 1908, DURING THE YEAR ENDED 31ST MARCH, 1931.

Name of Seaman.	Balance to Credit of the Estate on 31st March, 1930.	Amount received.	Amount paid.	Balance to Credit of the Estate on 31st March, 1931.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Anderson, M.	25 5 2	3 10 0	28 15 2	..
Bannen, T.	..	8 4 10	..	8 4 10
Cliffe, F.	5 10 6	..	5 10 6	..
Darling, J.	1 8 8	..	1 8 8	..
Dohrn, R. C. H.	57 12 0	..	57 12 0	..
Duncan, A. W.	..	0 1 7	..	0 1 7
Hartnett, R.	..	8 2 6	8 2 6	..
King, W.	24 19 8	..	24 19 8	..
Kingdon, H.	..	5 0 0	5 0 0	..
Lester, C. E.	..	34 13 1	34 13 1	..
Nelson, R.	1 1 7	..	1 1 7	..
Robinson, W.	..	9 5 1	9 5 1	..
Small, T.	12 15 6	0 5 6	13 1 0	..
Wishart, A.	..	3 17 0	3 17 0	..
	128 13 1	72 19 7	193 6 3	8 6 5

RETURN SHOWING AMOUNTS RECEIVED PRIOR TO 1ST APRIL, 1930, STANDING TO CREDIT OF ESTATES OF DECEASED SEAMEN, AND FOR WHICH CLAIMS HAVE NOT BEEN PROVED.

Name of Seaman.	Balance to Credit of the Estate on 31st March, 1931. £ s. d.
Evans, W., late cook, m.v. "Opawa"	8 10 4
King, C., late A.B., scow "Herald"	8 5 2
Lancaster, J. H., late A.B., s.s. "Gale"	50 1 11
McMahon, S. G., late seaman, s.s. "Apanui"	13 2 2
Peterson, F., late A.B., s.s. "Tiroa"	34 10 1
Welsh, T. B., late second cook, s.s. "Marama"	8 7 0
Williams, E. C., late assistant steward, s.s. "Maheno"	2 18 9
	£125 15 5

SUMMARY OF EXAMINATIONS FOR CERTIFICATES OF COMPETENCY AS MASTERS, MATES, AND ENGINEERS FOR THE YEAR ENDED 31ST MARCH, 1931.

Class of Certificate.	Auckland.			Wellington.			Lyttelton and Christchurch.			Dunedin.			Other Places.			Totals.		
	Passed.	Failed.	Total.	Passed.	Failed.	Total.	Passed.	Failed.	Total.	Passed.	Failed.	Total.	Passed.	Failed.	Total.	Passed.	Failed.	Total.
Foreign-going masters and mates	19	20	39	6	6	12	..	2	2	..	..	..	..	..	..	25	28	53
Voluntary examination in compass-deviation	1	..	1	..	1	1	..	..	..	..	..	..	..	..	..	1	1	2
Honorary certificate in efficiency members, R.N.V.R.	1	2	3	..	..	..	..	..	..	..	..	..	..	..	..	1	2	3
Home-trade masters and mates	3	3	6	..	..	..	1	..	1	..	..	..	..	..	..			7
Masters of river-steamers ..	1	2	3	..	1	1	..	1	1	..	..	..	..	..	..	1	4	5
Masters of sailing-vessels plying in harbours and rivers	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1
Seagoing engineers (steam) ..	29	25	54	11	13	24	20	15	35	9	13	22	26	29	55	95	95	190
River engineers (steam) ..	4	2	6	..	..	..	..	..	..	..	1	1	3	1	4	7	4	11
Marine engine-drivers (steam)	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1
Seagoing engineers (oil) ..	21	9	30	6	6	12	7	1	8	2	..	2	19	2	21	55	18	73
River engineers (oil) ..	8	1	9	2	..	2	..	..	..	6	..	6	22	5	27	38	6	44
Totals	89	64	153	25	27	52	28	19	47	17	14	31	70	37	107	229	161	390

Summary of Casualties to Shipping reported to the Marine Department during the Year ended 31st March, 1931.

Nature of Casualty.	Casualties on or near the Coasts of the Dominion.									Casualties outside the Dominion.									Total Number of Casualties reported.		
	Steamers.			Sailing-vessels.			Total within Dominion.			Steamers.			Sailing-vessels.			Total outside Dominion.					
	No. of Vessels.	Tonnage.	No. of Lives lost.	No. of Vessels.	Tonnage.	No. of Lives lost.	No. of Vessels.	Tonnage.	No. of Lives lost.	No. of Vessels.	Tonnage.	No. of Lives lost.	No. of Vessels.	Tonnage.	No. of Lives lost.	No. of Vessels.	Tonnage.	No. of Lives lost.	No. of Vessels.	Tonnage.	No. of Lives lost.
Strandings—																					
Total loss	4	35	5	..	..	..	4	35	5	1	4,155	..	..	..	..	1	4,155	..	5	4,190	5
Slight damage	11	10,927	3	1	25	..	12	10,952	3	..	..	..	..	..	..	..	..	..	12	10,952	3
No damage	7	8,274	..	..	..	..	7	8,274	..	1	5,231	..	..	..	..	1	5,231	..	8	13,505	..
Total strandings	22	19,236	8	1	25	..	23	19,261	8	2	9,386	..	..	..	..	2	9,386	..	25	28,647	8
Collisions—																					
Total loss	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Slight damage	15	15,539	..	..	..	..	15	15,539	..	..	..	..	..	..	..	..	..	..	15	15,539	..
No damage	2	931	..	..	..	..	2	931	..	..	..	..	..	..	..	..	..	..	2	931	..
Total collisions	17	16,470	..	..	..	..	17	16,470	..	..	..	..	..	..	..	..	..	..	17	16,470	..
Miscellaneous	21	14,408	..	..	..	..	21	14,408	..	7	34,852	..	..	..	..	7	34,852	..	28	49,260	..
Total number reported	60	50,114	8	1	25	..	68	50,139	8	9	44,238	..	..	..	..	9	44,238	..	70	94,377	8

Return of Land Boilers and Machinery inspected during the Year ended 31st March, 1931.

Class.	Not exceeding 5 Horse-power.	Exceeding 5 but not exceeding 10 Horse-power.	Exceeding 10 Horse-power.	Total.
Boilers—				
Stationary, portable, and traction	1,115	1,383	2,491	4,989
Digesters, jacketed pans, sterilizers, vulcanizers, and other steam receivers	..	..	..	2,613
Air-receivers	..	..	..	543
Total boilers	..	..	..	8,145
Machinery—				
Electric motors	19,845	3,932	4,595	28,372
Internal-combustion engines ..	12,200	1,042	1,268	14,510
Water-power engines ..	280	102	215	597
Lifts	..	..	..	3,096
Cranes	..	..	..	287
Hoists	..	..	..	1,323
Total machinery ..	..	..	..	48,185
Grand total	..	..	..	56,330

Return of New Boilers inspected for the Year ended 31st March, 1931.

Class.	Made in Dominion.		Imported.		Total.	
	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.
Stationary, portable, and traction	46	927	55	1,483	101	2,410
Digesters, jacketed pans, sterilizers, vulcanizers, and other steam receivers	79	..	81	..	160	..
Air receivers	67	..	126	..	193	..
Totals	192	927	262	1,483	454	2,410

Return of the Number of Certificates issued to Land Engine-drivers and Electric tram Drivers during the Year ended 31st March, 1931.

Class.	Number.	Class.	Number.
Service—First-class engine-driver	1	Competency—*continued.*	
Competency—		Locomotive- and traction-engine driver ..	41
First-class engine-driver	24	Locomotive-engine driver	4
Second-class engine-driver	157	Traction-engine driver	23
Steam-winding-engine driver	4	Electric-tram driver	43
Electric-winding-engine driver	1		298

Return of Land Engineers', Engine-drivers', and Electric-tram Drivers' Examinations held throughout New Zealand during the Year ended 31st March, 1931, showing the Number of Successful and Unsuccessful Candidates.

Place.	First Class.		Second Class.		Steam Winding.		Electric Winding.		Locomotive and Traction.		Loco-motive.		Traction.		Electric-tram Driver.		Total.		Grand Total.
	P.	F.	P.	F.	P.	F.	P.	F.	P.	F.	P.	F.	P.	F.	P.	F.	P.	F.	
Auckland	2	1	21	8	..	..	..	..	7	..	..	2	..	..	5	..	35	11	46
Christchurch ..	..	..	3	1	..	..	..	..	3	1	1	..	5	..	14	..	26	2	28
Dunedin	3	3	4	5	..	..	..	..	2	..	..	1	3	1	11	..	23	10	33
Gisborne	1	1	5	..	..	..	..	..	..	..	..	..	..	..	..	..	6	1	7
Greymouth	2	2	7	5	..	..	..	..	3	..	1	..	..	..	..	..	13	7	20
Hamilton	1	1	28	14	3	..	1	..	2	1	..	1	..	..	..	..	35	17	52
Invercargill	..	1	7	10	..	..	..	..	3	..	1	..	1	1	..	..	12	12	24
Napier	1	2	10	4	..	..	..	..	..	..	..	..	..	..	..	..	11	6	17
Nelson	..	..	13	4	..	..	..	..	..	..	..	..	1	..	..	..	14	4	18
New Plymouth ..	1	1	16	9	..	..	..	..	1	..	..	..	1	..	..	1	19	11	30
Palmerston North ..	3	4	10	5	..	..	..	..	1	..	1	..	..	..	..	..	15	9	24
Thames	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1
Timaru	..	..	3	..	..	..	..	..	2	..	..	..	12	1	..	..	17	1	18
Wanganui	2	1	6	2	..	..	..	..	..	..	..	..	..	..	..	..	8	3	11
Waimana	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1
Wellington	2	2	9	1	..	..	..	..	..	..	..	..	..	..	13	3	24	6	30
Whangarei	1	2	5	7	..	..	..	..	1	1	..	..	..	..	..	..	7	10	17
Totals	19	21	148	76	3	..	1	..	25	3	4	4	23	3	43	4	266	111	377

FISHERIES TABLE I.—SHOWING THE NUMBER OF FISHING-VESSELS AND THE NUMBER OF FISHERMEN AND OTHER PERSONS ENGAGED IN THE FISHING INDUSTRY AT EACH PORT FOR THE YEAR ENDED 31ST MARCH, 1931.

Name of Port.	Vessels engaged in Fishing for Wet Fish.														Vessels engaged in Shell-fishery.						Number of Persons employed.					
	Steamers Trawling.		Motor Trawlers.		Steamers Danish-seining.		Motor-vessels Danish-seining.		Motor-vessels, Set-net and Line Fishing.		Sailing-boats.		Rowing-boats.		Oyster-dredging Vessels.		Mussel-dredging Vessels.		Crayfishing Vessels.		Fishermen.		Others.		Total.	
	Whole Time.	Part Time.	Whole Time.	Part Time.	Whole Time.	Part Time.	Whole Time.	Part Time.	Whole Time.	Part Time.	Whole Time.	Part Time.	Whole Time.	Part Time.	Whole Time.	Part Time.	Whole Time.	Part Time.	Whole Time.	Part Time.	Whole Time.	Part Time.	Whole Time.	Part Time.	Whole Time.	Part Time.
Russell	..	..	..	..	..	..	..	..	12	9	..	2	12	8	..	..	..	..	..	2	55	49	..	12	55	61
Kaipara	..	..	..	..	..	..	..	..	27	8	..	..	1	7	..	..	..	..	..	..	35	16	3	..	38	16
Whangarei	..	..	..	..	..	..	2	..	8	..	..	..	1	..	..	..	..	..	..	..	20	..	6	..	26	..
Auckland*	..	..	4	1	..	..	..	..	20	6	63	50	..	1	50	40	..	..	1	1	..	40	312	135	130	..	442	135
Thames	..	..	..	..	..	..	..	..	8	5	27	5	..	..	2	3	..	..	2	..	..	..	98	4	22	..	120	4
Tauranga	..	..	..	..	..	..	..	..	6	..	15	..	..	5	..	10	..	..	..	..	..	..	40	..	8	..	48	..
Gisborne	..	..	1	..	..	2	..	..	..	..	9	2	..	..	..	16	..	..	..	..	..	27	23	43	8	..	31	43
Napier	..	..	5	5	..	..	..	..	..	..	10	5	..	..	59	50	..	..	..	..	..	14	111	65	24	8	135	73
New Plymouth	..	..	..	..	..	..	..	..	..	..	14	1	..	..	2	6	..	..	..	..	..	10	39	13	6	..	45	13
Wanganui	..	..	..	..	..	..	..	..	..	..	3	16	..	..	..	..	..	..	..	..	..	..	9	18	..	..	9	18
Wellington	..	..	2	..	..	..	..	..	..	..	44	24	..	1	6	21	..	..	..	..	4	35	148	72	26	4	174	76
Picton	..	..	..	..	..	..	..	..	..	..	19	21	..	..	..	2	..	..	..	..	..	3	36	44	..	..	36	44
Blenheim (Wairau)	..	..	..	..	3	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	6	16	..	..	6	16
Nelson	..	..	2	..	1	..	..	..	2	..	11	7	..	..	..	5	..	..	..	..	2	..	37	24	10	..	47	24
Westport	..	..	..	..	1	9	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	1	2	13	..	..	2	13
Greymouth	..	..	..	..	..	4	..	1	..	..	..	4	..	2	..	7	..	..	..	..	..	..	..	25	..	..	..	25
Kaikoura	..	..	..	..	..	1	..	..	..	..	19	..	..	..	..	..	..	..	..	..	..	9	28	..	1	..	29	..
Akaroa	..	..	..	..	3	8	..	..	..	4	18	..	..	..	7	3	..	..	..	..	..	4	30	10	2	..	32	10
Lyttelton	..	..	2	..	9	..	1	..	3	2	28	10	..	5	41	51	..	..	..	..	..	6	107	80	80	..	187	80
Timaru	..	..	..	..	..	22	..	..	..	5	..	..	..	..	..	2	..	..	..	..	..	..	30	3	3	..	33	3
Oamaru (including Moeraki)	..	..	..	..	..	..	..	..	..	..	40	1	..	..	..	..	..	..	..	..	..	1	55	1	5	1	60	2
Dunedin and Otago District	..	4	..	11	8	..	..	..	..	..	67	7	..	..	11	7	..	..	..	..	5	4	224	16	100	..	324	16
Bluff, Invercargill, and District	..	..	1	..	..	..	..	..	..	..	46	51	..	..	..	8	7	..	..	..	..	..	100	150	30	..	130	150
Stewart Island	..	..	..	..	..	..	..	..	..	..	44	..	..	..	..	..	..	..	..	..	..	1	94	..	10	..	104	..
Chatham Islands	..	..	..	..	..	..	..	..	..	..	12	..	..	..	..	..	..	..	..	..	..	..	33	..	14	..	47	..
Five minor ports (combined)	..	..	..	..	..	..	..	..	..	1	6	6	1	..	15	48	..	..	..	1	1	3	17	93	..	..	17	93
Totals	..	..	20	7	28	62	1	1	41	23	542	229	1	16	207	294	7	..	3	2	12	161	1,689	890	488	25	2,177	815

* Including Manukau, Coromandel, and Mercury Bay.

Fisheries Table II.—Showing the various Kinds of Fish caught and approximately the Total Quantities of Fish* and Shell-fish landed at the Chief Fishing-ports for the Year ended 31st March, 1931.

Name of Port.	Principal Kinds of Fish caught.	Quantity landed.	Total Value (Fish).	Shell Fishery (excluding Toheroa).							Grand Total Value.
				Oysters.	Value.	Mussels.	Value.	Crayfish.	Value.	Total Value (Shell-fish)	
		Cwt.	£	Sacks.	£	Sacks.	£	Cwt.	£	£	£
Russell	Snapper, mullet, flounder, hapuku, crayfish, piper, kingfish, tarakihi, gurnard, kahawai	4,790	4,845	..	..	..	..	40	73	73	4,918
Kaipara	Flounder, snapper, mullet	5,550	8,742	..	..	..	..	..	..	..	8,742
Whangarei	Snapper, flounder, hapuku, mullet	3,900	6,206	..	..	..	..	..	..	..	6,206
Auckland (including Manukau and Coromandel)	Snapper, flounder, tarakihi, hapuku, gurnard, dogfish, dory, mullet, crayfish, blue cod, kingfish, trevalli, frostfish, barracouta, piper, herrings, oysters (rock), mussels, sardines	104,098	88,947	5,215	6,258	3,000	750	1,949	3,592	10,600	99,547
Thames	Snapper, flounder, dabs, mullet, gurnard, dogfish, dory, herrings	26,991	30,247	..	..	2,704	899	..	..	899	31,146
Tauranga (including Mercury Bay)	Snapper, hapuku, tarakihi, gurnard, trevalli, dogfish, mullet, blue-cod	7,965	7,408	..	..	..	..	..	..	..	7,408
Gisborne	Tarakihi, snapper, hapuku, gurnard, sole, flounder, kahawai, crayfish	3,093	4,009	..	..	..	..	..	..	..	4,009
Napier	Tarakihi, gurnard, soles, flounders, snapper, hapuku, barracouta, john-dory, moki, trevalli, kingfish, kahawai, whitebait, brill, mullet, warehou	17,560	28,653	..	..	520†	390	429	700	1,090	29,743
New Plymouth	Snapper, hapuku, cod, crayfish, tarakihi, gurnard, herrings, kingfish, kahawai	1,610	2,257	..	..	..	..	108	150	150	2,407
Wanganui	Snapper, hapuku, blue-cod, flounder	396	580	..	..	..	..	..	..	..	580
Wellington	Tarakihi, hapuku, hake, ling, bass, crayfish, warehou, moki, flounder, sole, butterfish, kahawai, blue-cod, trevalli, snapper, gurnard, bream, kingfish, skate, whitebait, garfish, red-cod, conger, kelpfish	80,533	94,749	..	..	..	..	(?)	(?)	(?)	94,749
Picton	Flounder, butterfish, garfish, moki, blue-cod, herring (bait), hapuku, crayfish	4,680	4,368	..	..	..	..	25	35	35	4,403
Blenheim (Wairau)	Sole, flounder, tarakihi, gurnard, butterfish, snapper, moki, red-cod, hapuku, crayfish	2,380	3,040	..	..	..	..	100	100	100	3,140
Nelson	Snapper, flatfish, gurnard, blue-cod, bream, hapuku, crayfish	3,039	4,837	..	..	..	..	40	38	38	4,875
Westport	Groper, flounder, kahawai, soles, turbot, herring, cod	182	191	..	..	..	..	20	16	16	207
Greymouth	Soles, groper, snapper, turbot, flounders, herrings, red-cod, ling	1,090	2,249	..	..	..	..	..	..	..	2,249
Kaikoura	Groper, trumpeter, hake, ling, tarakihi, bass, blue-cod, and crayfish	2,580	4,192	..	..	..	..	..	..	..	4,192
Akaroa	Groper, flounders, soles, brill, blue-cod, red-cod, barracouta, moki, butterfish, kingfish, conger-eel	3,659	6,382	..	..	..	..	..	..	..	6,382
Lyttelton	Flatfish, groper, tarakihi, ling, elephant-fish	13,090	15,272	..	..	..	..	..	..	..	15,272
Timaru	Flounders, sole, groper, red-cod, ling, occasional kingfish, elephant-fish, barracouta, brill, and gurnard	8,292	17,228	..	..	..	..	..	..	..	17,228
Oamaru	Groper, blue-cod, red-cod, ling, barracouta, moki, warehou, soles, crayfish	2,292	2,692	..	..	..	..	..	..	..	2,692
Moeraki	Groper, blue-cod, red-cod, ling, barracouta, moki, warehou, soles, crayfish	3,743	4,429	..	..	..	..	10	6	6	4,435
Dunedin and Otago Districts	Groper, kingfish, blue-cod, flounders, soles, brill, bream, trevalli, garfish, red-cod, tarakihi, barracouta, moki, trumpeter, ling, mullet, red perch, kelpfish, elephant-fish, kahawai, skate	42,240	31,680	..	..	..	..	..	..	..	31,680
Invercargill, Bluff, and District	Blue-cod, groper, flounders, green-bone, trevalli, ling, kingfish, crayfish	6,868	10,700	42,744	26,715	..	..	..	..	26,715	37,415
Stewart Island	Blue-cod, groper, trumpeter, green-bone, moki	7,903	11,750	..	..	..	..	4	5	5	11,755
Chatham Islands	Blue-cod, hapuku, trumpeter	7,433	4,897	..	..	..	..	..	..	..	4,897
Four minor ports (combined)	Snapper, mullet, flounder, tarakihi, hapuku	3,389	6,125	..	..	..	..	5	18	18	6,143
	Totals	369,346	406,675	47,959	32,973	6,224	2,039	2,730	4,733	39,745	446,420

* Not including whitebait. † Including also cockles and pipis.

FISHERIES TABLE III.—SHOWING THE NUMBER OF SACKS AND VALUE OF THE OYSTERS OBTAINED IN THE DOMINION DURING THE YEAR ENDED 31ST DECEMBER, 1930.

Locality.	Quantity.	Value (Wholesale).
DREDGE-OYSTERS.		
	Sacks.	£ s. d.
Foveaux Strait	42,744	26,715 0 0
ROCK-OYSTERS.		
Bay of Islands	2,522	
Kaipara Harbour	699	
Hauraki Gulf*	1,109	6,258 0 0
Coromandel	309	
Great Barrier Island	576	
Total	5,215	
Grand total	47,959	32,973 0 0

* Takatu to Gull Point, 437; South Shore, Tamaki Strait, 70; Kawau, 20; Motutapu, 202; Motuihi, 99; Waiheke, 58; Ponui, 15 Pakihi, 53; Crusoe Island, 14.

FISHERIES TABLE IV.—SHOWING NUMBER AND SPECIES OF WHALES TAKEN OFF NEW ZEALAND COAST, WITH QUANTITY OF PRODUCTS FOR THE YEAR ENDED 31ST MARCH, 1931.

Whaling-station.	Number of Whales taken.	Species.	Yield of Oil.	Quantity of Bonedust and Fertilizer.
			Tons.	Tons.
Whangamumu (Russell)	31	Humpback ..	140	30
Marlborough Sounds (Picton)	47	,, ..	200	50
	1	Blue whale ..		
Totals	79	..	340	80

FISHERIES TABLE V.—SHOWING THE TOTAL QUANTITY AND VALUE OF FISH AND SHELL-FISH IMPORTED INTO AND EXPORTED FROM NEW ZEALAND DURING THE YEAR ENDED 31ST MARCH, 1931.

Fish and Shell-fish imported.

Description of Fish.	Quantity.	Value.
		£
Oysters	Nil	..
Anchovies, salted, in containers of 28 lb. or over	46 cwt.	84
Other fish—		
Frozen, smoked, pickled, dried, or salted	1,388 cwt.	4,336
Potted and preserved in tins	2,870,316 lb.	110,662
Total value of imports	..	115,082

Fish and Shell-fish exported.

Description of Fish.	Exporting Ports.	Quantity.	Value.
Produce of New Zealand.			£
Oysters, fresh	Auckland	480 doz.	10
	Wellington	4,690 doz.	87
	Invercargill (Bluff)	135,119 doz.	1,403
	Total	140,289 doz.	1,500
Blue cod, frozen	Auckland	5 cwt.	21
	Wellington	2,141 cwt.	7,123
	Lyttelton	112 cwt.	319
	Dunedin	16 cwt.	56
	Invercargill (Bluff)	7,230 cwt.	19,694
	Total	9,504 cwt.	27,213
Snapper, frozen	Auckland	1,492 cwt.	2,026
	Wellington	132 cwt.	248
	Total	1,624 cwt.	2,274
Flounder, frozen	Auckland	745 cwt.	2,519
	Wellington	86 cwt.	215
	Lyttelton	412 cwt.	1,215
	Dunedin	233 cwt.	691
	Invercargill (Bluff)	421 cwt.	1,134
	Total	1,897 cwt.	5,774
Other kinds, frozen	Auckland	1,977 cwt.	5,550
	Wellington	1,309 cwt.	2,989
	Greymouth	21 cwt.	181
	Lyttelton	595 cwt.	1,075
	Dunedin	63 cwt.	120
	Invercargill (Bluff)	688 cwt.	1,871
	Total	4,653 cwt.	11,786
Total exports of frozen fish from Dominion	..	17,678 cwt.	47,047
Smoked dried, pickled, or salted	..	1,128 cwt.	3,744
Preserved in tins—			
Oysters	..	15,079 lb.	1,207
Toheroas	..	46,220 lb.	3,355
Whitebait	..	39,066 lb.	4,908
Other kinds	..	2,347 lb.	411
Value of total exports of New Zealand fish and shell-fish	..	..	60,672
Re-exports.			
Potted and preserved in tins	..	26,009 lb.	1,059

Approximate Cost of Paper.—Preparation, not given; printing (675 copies), £52.

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