1930.

NEW ZEALAND.

MARINE DEPARTMENT.

ANNUAL REPORT FOR 1929-30.

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

YOUR EXCELLENCY,— Marine Department, Wellington, 16th September, 1930.

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. B. DONALD,
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, 13th September, 1930.

I have the honour to submit the annual report on the operations of the Marine Department for the financial year ended 31st March, 1930.

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.	1926-27.	1927-28.	1928-29.	1929-30.
		Revenue.			
Shipping Branch—	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Light dues	39,688 16 8	81,064 9 8	81,247 11 8	80,979 13 11	82,710 19 6
Engagement and discharge fees	3,179 11 0	3,124 13 3	2,790 2 6	2,583 2 9	2,614 3 0
Survey fees	3,095 9 0	5,371 7 8	5,144 7 6	5,123 8 6	5,037 12 6
Examination fees, &c.	395 12 6	379 5 0	321 5 0	268 8 0	296 5 0
Miscellaneous	1,289 0 4	505 18 3	427 5 11	296 6 11	673 15 1
Harbours—					
Pilotage, port charges, &c.	764 14 6	920 17 1	1,801 18 10	1,998 18 5	1,866 17 2
Foreshore revenue	1,126 14 1	5,988 17 4	6,212 2 3	5,582 0 5	4,817 17 9
Inspection of Machinery—					
Inspection fees, &c.	17,126 19 0	19,531 8 3	19,549 16 9	19,922 9 4	20,790 14 9
Examination fees, &c.	667 0 0	556 4 0	497 5 0	402 5 0	369 7 0
Fisheries—					
Net profit from sale of oysters	2,546 9 6	1,347 11 7	1,003 17 11	1,160 0 11	1,850 3 4
Fishing-boat license fees, &c.	324 9 6	629 15 9	845 0 1	542 0 6	622 13 7
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	5,134 9 6	1,458 9 2	4,046 7 3	1,733 2 6
Ross Sea revenue	..	2,921 5 0	7,176 15 0	13,961 17 6	7,871 5 0
Miscellaneous revenue	2,800 11 4	1,693 12 2	1,616 3 7	2,719 13 3	1,584 5 7
Totals	74,800 8 0	129,469 14 6	130,392 1 2	139,886 12 8	133,139 1 9
		Expenditure.			
Head Office	9,612 2 8	10,007 16 10	9,721 15 2	9,397 4 4	9,273 9 10
Harbours	4,826 13 2	3,938 6 0	7,790 0 0	4,059 18 4	3,576 9 8
Lighthouses	26,995 19 5	24,157 5 4	24,266 9 2	23,919 13 11	24,409 0 8
Meteorological	5,374 0 3	..	..	..	..
Mercantile marine	15,150 17 11	25,021 18 8	24,792 14 9	25,266 9 2	25,308 8 0
Inspection of Machinery	27,015 0 0	22,288 13 8	21,842 2 1	21,573 2 7	21,907 3 0
Fisheries	4,545 3 2	3,385 5 11	3,389 19 10	3,281 12 10	3,727 1 2
Government steamers	21,697 19 6	22,605 0 4	20,733 16 9	21,559 12 3	20,820 19 5
Miscellaneous services	2,655 3 8	2,861 17 4	2,161 11 7	2,146 4 0	2,138 9 11
Grants and subsidies	1,510 0 0	290 0 0	594 0 0	260 0 0	1,350 0 0
Depreciation	8,035 4 9	9,032 5 3	9,158 5 10	9,662 2 8	9,748 17 5
Interest on Capital	15,716 7 3	18,005 6 0	18,119 18 0	17,285 17 5	17,434 15 2
Totals	143,134 11 9	141,593 15 4	142,570 13 2	138,411 17 6	139,694 14 3

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

Summarized, the results of the past nine 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	,, 53,456 11 3	,, 69,172 18 6
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	,, 10,879 2 8	Deficiency 6,555 12 6

From this it will be seen that the Department's financial position has improved considerably since the commercial balance-sheet system came into operation. In 1921–22 the deficiency was £95,153 14s. 11d., while during 1929–30 this figure was reduced to £6,555 12s. 6d., a net betterment of £88,598 2s. 5d.

The reason for the deficit during the year under review, in comparison with the surplus of the previous year, is that the revenue from whaling operations in the Ross Sea has shown a considerable decrease during 1929–30.

Harbour Boards' Special Legislation.

Bluff Harbour Board Reclamation and Empowering Act, 1929.—This Act—

(*a*) Authorizes the Board to reclaim 26 acres of land from the sea in Bluff Harbour.

(*b*) Authorizes the vesting of the land in the Board.

(*c*) Confers, in respect of this area, on the Board the leasing-powers conferred by the Public Bodies' Leases Act, 1908.

(*d*) Empowers the Board to carry on the passenger and cargo service to Stewart Island. This special power was granted as it is not one of the general powers conferred on Harbour Boards by the Harbours Act, 1923, and the Board has a vessel not fully occupied on harbour-work and thus able to carry on the island service.

Gisborne Harbour Board Amendment Act, 1929.—The main proposal of this Act was to rectify the position in regard to the Board's inability to secure title to certain tidal lands and tidal waters vested in it by previous legislation.

A proposal contained in the Bill as introduced into Parliament, to authorize reclamation of the areas, was deleted, and the Board's powers to lease any parts of the area were restricted to the powers of leasing foreshore and tidal waters conferred upon it by the Harbours Act, 1923.

Lyttelton Harbour Board Reclamation Validation Act, 1929.—In 1910 the Board was authorized to reclaim certain lands at Lyttelton, which land was vested in the Board. It was subsequently found that an additional 2 acres 3 roods 30 perches had been included in the work of reclamation; and the purpose of this Act was to validate the reclamation of this additional piece and vest it in the Board.

Otago Harbour Board Empowering Act, 1929.—The Otago Harbour Board Empowering Act, 1926, authorized the Board to borrow, among other items, the sum of £25,000 for construction of a harbour warehouse. The 1929 Bill, as promoted by the Board, sought authority to expend this amount on the following works, instead of on the warehouse, the Board stating that these were of a more urgent nature :—

(*a*) Purchase and erection of two cranes for Victoria Wharf, and repairing that wharf and providing railway connection, £22,250.

(*b*) Erection of a bridge connecting the school-site vested in the Otago Education Board, £1,200.

(*c*) Shed appliances for handling goods, £1,550.

The Bill also contained minor clauses relating to leases of certain of its endowment lands.

The proposals outlined above were agreed to, and the Bill passed into law with the addition of a clause authorizing the Board to enter into an agreement with the Railway Department for railway connection with the Victoria Wharf.

Sumner Borough Land Vesting Act, 1929.—This Act vested in the Sumner Borough Council a small area of waste tidal land in the Heathcote and Avon Estuary, between the tram-line and the Sumner Road, with a view to its being improved for public purposes.

Timaru Harbour Board Loan Act, 1929.—The principal provision in this Act is the authority granted to the Board to borrow £25,000 for repairing damage done to the Eastern Extension Mole by a heavy storm; raising, improving, and strengthening the mole; and arresting shingle encroachment.

Additional provisions include the requirement of a poll to be taken for consent of the ratepayers, and the machinery for taking the poll; the levy and collection of the rates required for the loan security; remedies of debenture-holders in the event of default by the Board; power for the Board to pay off loan by instalments; and the establishment of a Renewal and Reserve Fund.

Wanganui Harbour District and Empowering Amendment Act, 1929.—This Act empowers the Board to borrow a further sum or sums, not exceeding in the aggregate £200,000, for the following purposes: Raising the moles, £12,000; extending the moles, £90,000; new dredge, £50,000; Admiralty claim ("Kaione"), £15,000; first year's interest and sinking fund, £13,000; engineering, promoting flotation, and contingencies, £10,000; plant and equipment, £10,000: total, £200,000.

The Board's 1913 Empowering Act authorized the Board to levy differential dues on goods in favour of those produced or manufactured in the harbour district, as against those manufactured outside. An amending provision was inserted in the 1930 Act, at the instance of the Department, to the effect that the power to levy these differential dues shall not now be exercised by the Board in any year in which no rate is levied, pursuant to section 10 of the 1913 Act, to meet the difference between the estimated ordinary revenue and the estimated ordinary expenditure.

Harbour-works.

Karamea Harbour.—The area surrounding this harbour was unfortunately situated close to one of the centres of disturbance in the earthquake of June, 1929, and the harbour suffered very considerable damage accordingly. The wharf was wrecked; the wooden training-wall which was being used as a staging for depositing stone for the new training-wall was so damaged as to render it useless for the latter purpose, thus increasing the cost of this work; and in the flood which occurred on the 29th December enormous quantities of sand and silt were deposited in the bed of the river between the gorge and the sea. This debris was due to the large earthquake-slips which had occurred in the higher reaches being washed down by flood-waters. As a consequence of this the river-channel is at present bad for navigation, and it is somewhat difficult to forecast what course the river will take in the next flood.

Plans were prepared for the erection of a new wharf on standard lines, but work was not commenced pending consideration of alternative proposals on lines locally suggested as being more suitable to the needs of the district. In the meantime the working of the harbour by shipping has become so impaired as the result of the bad condition of the channel which followed the flooding of the river on the 29th December that it is generally recognized that it would be unwise to take any further steps until the position has definitely improved, it being anticipated that such will not become manifest until after the heavy rains of the coming spring have passed, if then.

A considerable amount of snagging has been carried out in the main channel, in order to as far as possible keep the water in that channel and remove any obstruction which would tend to form sandbanks, with the consequent detrimental changes in the channel.

A comprehensive survey of the harbour area and adjacent portions of river and overflow-channel is being carried out for future reference.

Prior to the earthquake the laying of tram-line from the quarry to the training-wall had been completed, and a certain amount of stone had been run out to strengthen the end of the tramway. It was fortunate that this had been done, otherwise the whole of the outer end of the existing wall would inevitably have collapsed.

Before the tipping of stone could be resumed a very considerable length of the tram-line had to be lifted, straightened, and repacked. Four chains of stone bank had to be built, the trestle leading on to the shoreward end of the wall having collapsed. Thirteen chains of the old timber wall had to be straightened up again and reconditioned, and, the last 4 chains of the wall being beyond reconditioning, the permanent replacing of this length with a stone wall is now in hand.

The lower quarry, near the mouth of the Oparara Gorge, has never been satisfactory, the stone breaking out too small, and a better face was located half a mile farther up the Gorge; this has been opened up and a large shot fired with very satisfactory results. An adequate supply of large stone is now assured to complete the works.

On account of the subsidence of the land on which the Harbourmaster's house was situated, it became uninhabitable, so that it has been necessary to acquire a new section and shift the house to it.

Waikokopu Harbour.—During the year this port has been well patronized by shipping, and the wharf facilities have been well maintained.

The contractor for the rock breakwater has completed approximately 50 per cent. of his original contract, and to date approximately 16,000 tons of stone have been tipped. This has already reduced the range and increased the number of workable days at the wharf.

The Tahaenui quarry, from which the rock for the breakwater is being obtained, has opened up well. The quality of the rock is good, and the present indications point to it resisting the action of sea and atmosphere very well.

The shelter-shed on the wharf was burnt down during the year, and was re-erected on a larger scale, and a waterside workers' accommodation building has been built.

Electric power from Waikaremoana will shortly be available at Waikokopu, when it can be used for all lighting and harbour facilities in place of the present small petrol lighting-set.

Karaka Point Wharf.—The approach work at this wharf has been completed, and the wharf is now connected up with the Whakarapa Road inland.

Matiotitawa Wharf.—This wharf has been built, and the approaches are in hand.

Rawene Launch and Motor Landing.—This work has now been completed, and both the incline ramp and the pontoon landing have been working satisfactorily.

Tikinui Wharf.—The new wharf has been completed during the year, together with small tram-line, portable crane, and shed.

Tutukaka Wharf.—Plans have been prepared for the construction of a new wharf on the south side of the harbour.

Coromandel Wharf.—General repairs to this structure have been carried out by the county, and a detailed survey of the harbour was made by the Department to determine the best location for the proposed new wharf.

Port Jackson.—The removal of the reef near Port Jackson has been satisfactorily completed.

Whangamata Wharf.—This wharf was erected during the year. It consists of a hardwood superstructure with turpentine piles.

French Pass.—Repairs were effected to the wharf, and portion of the overhanging cliff adjacent to the lighthouse was removed, it having been damaged by the earthquake.

Motueka Harbour.—A comprehensive survey has been made of the harbour and neighbouring coast-line to keep in touch with the remarkable changes occurring there.

Lighthouses.

Cape Egmont.—The original light, which was one of the older type of fixed incandescent oil-burning lights, has been replaced by one comprising an up-to-date revolving lens with a fixed incandescent acetylene-burner and sun-valve. The whole apparatus, both lighting and revolving, is operated by the pressure of the gas, and is automatically turned on and off at sunset and sunrise by means of a sun-valve, which is operated by the difference between daylight and darkness. This light is now the most up-to-date installation in this country, and represents the most advanced type of automatic installation so far devised.

Godley Head Lighthouse.—Plans are being prepared for the conversion of this light from a fixed to a flashing light, and it is hoped to complete it during the ensuing year.

Tory Channel Leading-lights.—These leading-lights have now been converted from fixed low-powered oil-burning lights to automatic flashing acetylene-burners. It was necessary to adopt quick-flashing characteristics for both back and forward lights in order to give the same facility for keeping direction as with a pair of fixed lights, but without the disadvantages of the latter.

West Head Light, Tory Channel.—This light, which consists of a 300 mm. lens lantern with a 25-litre acetylene open-flame flashing burner, all mounted on a steel pedestal, is wholly automatic, and was erected during the period. Its function is to mark the entrance to Tory Channel, and enable shipping to readily pick up the leading-lights, which are only visible through the narrow arc of the entrance, and thus difficult to pick up in thick weather or if a vessel is approaching on a course widely different from the line of the leading-light.

Jack's Point.—This light, which was originally a watched oil-burning light of the third order, has been converted to automatic operation by the provision of an automatic flashing apparatus. In addition to this, a new 800 mm. lens has also been installed.

Kahurangi Point Lighthouse.—This lighthouse was severely damaged in the earthquake of June, 1929. Two of the cast-iron segments of the tower were cracked and the lens was completely shattered. The keeper's house was overwhelmed by a landslide. A temporary light was put into operation as soon as possible, and a new lens has been ordered and should be delivered shortly. New cast-iron sections for the tower to take the place of those damaged have also been manufactured and delivered.

Moeraki Lighthouse.—Plans of a new automatic flashing apparatus in place of the existing watched oil-burning apparatus are being prepared.

Portland Island Lighthouse.—A small wireless apparatus, of the type used in the launch lifeboat in overseas ships, has been procured for this station to enable communication to be established with the mainland in case of sickness. It is questionable whether such an apparatus will be effective, and the installation must therefore be looked upon as experimental. If it is not effective other arrangements will require to be made.

Banks Peninsula.—The existing light does not safeguard ships coming from the north from the peninsula. A new light will be erected somewhere in the locality of East Head, in a position, if such can be obtained, where it will be seen from north and south. If such a position cannot be obtained, then the existing light will remain for the guidance of vessels from the south.

Provision is also being made for a small light on Kapiti Island, and for increasing the range of visibility of Jackson's Head light.

The diaphone fog-signal apparatus for Taiaroa Head, similar to that at Pencarrow and Godley Heads, has arrived, and a commencement will shortly be made with the installation.

The transfer of the lighthouse and fog-signal from Pencarrow Head to Baring Head was deferred pending a trial of the new light at Cape Egmont. This has proved entirely satisfactory, and the light for Baring Head will be of the same type. It is hoped to proceed with this work, which is of considerable magnitude, in the near future.

New Lighthouse Tender.

The new lighthouse steamer to replace the "Tutanekai" is now on her way to New Zealand, and should arrive in Wellington about the 12th of October. The vessel will be an oil-burner convertible to coal-burning. She will be fitted with an automatic recording depth-finder, which should prove of considerable value in locating shoal patches and other underwater dangers to navigation. The plans and specifications of the ship were prepared by Mr. G. E. Breeze, Chief Surveyor of Ships.

Radio Direction-finding Apparatus for Navigational Purposes.

Since erecting the joint wireless and radio direction-finding beacon at Cape Maria Van Diemen the Department has taken no steps to provide further navigation aids of this class for the reason that there was very little response on the part of shipping in fitting the complementary apparatus. There are now, however, clear indications that this state of affairs is altering, and a number of the overseas ships are now so equipped or to be equipped. A general provision is being made on the appropriations to enable shore apparatus to be installed. It is proposed that there should be two beacons located somewhere in the Cook Strait area. This would greatly facilitate the approach of overseas vessels.

Adjustment and Inspection of Ships' Compasses.

During the year 183 compass-adjustments were investigated at Head Office. The work performed by the licensed adjusters of compasses at the various ports has been closely examined by the Department's Inspectors of Compasses, with the result that a high standard of efficiency of this important navigational instrument has been maintained. The gyroscopic compass is not as yet in use on any of our coastal ships. The beneficial results accruing from this compass in high latitudes, where the magnetic declination changes rapidly, are amply reflected in the fact that all the modern whale-factories operating in the Antarctic are now fitted with gyro compass and repeaters.

Marine Casualties.

The year witnessed a normal number of marine casualties at or near our coasts, varying considerably in their nature. The usual number of minor casualties caused by stranding, collision, fire, defective machinery, &c., continue to occur. This year there were eighty-seven vessels concerned in casualties with no lives lost, as against 112 casualties last year, with thirteen lives lost, eight of which were lost when the "Isabella de Fraine" capsized on the Hokianga Bar.

Preliminary inquiries have been held by departmental officers when considered advisable. During the year four casualties have warranted a Magisterial inquiry, three of which involved collisions between vessels, and one, the major casualty of the year, being the stranding and subsequent total loss of the s.s. "Manuka" at Long Point, Otago, on the 16th December, 1929.

"Notices to Mariners" and Navigational Warnings.

Information of importance relating to changes in the many descriptions of aids to navigation on our coasts and at more remote places frequented by our ships, and concerning newly discovered obstructions, derelicts, wreckage, &c., or other dangers which might affect shipping, has been published throughout the Dominion and overseas on occasions when such has been deemed necessary. This information, if of a general character and not requiring urgent dissemination, is issued in the form of "Notices to Mariners." During the year sixty-five such "Notices to Mariners" were published in the *New Zealand Gazette*. This Dominion reciprocates with other countries in the exchange of information concerning dangers and navigational aids. Warnings of an urgent nature relating to temporary extinction of lights or displacement of principal aids to navigation and other important hydrographic matter are broadcasted by wireless telegraphy. Thirty-five such notices were broadcasted during the year.

Admiralty Charts.

The Admiralty charts stocked by the Department are being increased annually as 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 must manifestly depend 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.

The examinations of masters and mates are conducted periodically at Auckland, Wellington, and Lyttelton. The total number of examinations held at those places for certificates of competency as master and as mate, and for certificate-holders who desired to have their certificates endorsed as having passed the voluntary examination in compass-deviation, was seventy-four. Six of these examinations were for certificates for restricted-limits ships, and two for the voluntary examination as yacht master in New Zealand waters. The latter examination is a purely voluntary one, and is confined to those persons who own or partly own pleasure yachts. The examination in navigation is similar to that of a home-trade master. The two successful candidates, both from Auckland, passed this examination creditably. The number of examinations held during each of the past ten years were: 1920–21, 107; 1921–22, 104; 1922–23, 91; 1923–24, 69; 1924–25, 105; 1925–26, 133; 1926–27, 96; 1927–28, 87; 1928–29, 69; 1929–30, 74. From year to year the number of candidates is found to vary considerably, and this variation would appear to depend upon the coaching facilities available in this Dominion.

After a period of eight years Auckland again provides the greatest number of candidates, the percentages of the total number of examinations held for each of the three ports being Auckland, 62 per cent.; Wellington, 28 per cent.; and Lyttelton, 10 per cent. These figures for 1928–29 were: Wellington, 46 per cent.; Auckland, 44 per cent.; and Lyttelton, 10 per cent. The improvement in Auckland being due to improved tuition facilities now provided at that place.

The proportion of passes to the total number of examinations held during the past ten years were: 50 per cent. in 1920–21, 50 per cent. in 1921–22, 43 per cent. in 1922–23, 51 per cent. in 1923–24, 46 per cent. in 1924–25, 34 per cent. in 1925–26, 38½ per cent. in 1926–27, 49½ per cent. in 1927–28, 56½ per cent. in 1928–29, and 55½ per cent. in 1929–30.

Twenty-two candidates were successful in passing their examination on first attempt, this number for last year being twenty-one.

The Board of Trade in Great Britain intends to make considerable alterations in the syllabus of examinations, to come into force on the 1st January, 1931, and this change, to be made here simultaneously, will no doubt decrease the percentages of passes in our examinations during the first year of the new syllabus. The Board also allows a candidate to attend the signalling portion of an examination within a period of six months before or after the examination proper, and a pass is allowed in the written or the oral portion of the examination and the candidate may obtain his certificate provided he completes the whole examination within six months. These changes are in favour of the candidate, as he will then be able to complete one portion of the examination at a time and will have more time to devote to those subjects in which he has shown weakness.

The sea service required for certificates has also been increased, and this may have a detrimental effect on the number of candidates.

Examination in Form and Colour Vision.

A total of sixty examinations in the sight tests were held at the four main ports. Of this total 48 per cent. were held at Auckland, 30 per cent. at Wellington, 15 per cent. at Lyttelton, and 7 per cent. at Dunedin.

One candidate was failed in the lantern test by the local examiner, but later exercised his right in appealing for a special examination, which was subsequently carried out, the result being that the candidate succeeded in passing.

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

The "New Zealand Nautical Almanac and Tide-tables" for the year 1930 (twenty-eighth edition) was issued in November last, so as to enable its contents to be available in ample time before the end of 1929 to ships proceeding beyond New Zealand.

Training-ship.

During the year representations have been made to the Government urging the re-establishment of a training-ship for youths desirous of following a seafaring life, and offers were made by Messrs. G. H. Scales and Co. of the barque "Rewa" and the Union Steamship Company of the steamer "Corinna," for the purpose.

During the years 1909 to 1922 the Department maintained the "Amokura" as a training-ship. This vessel was equipped for both steam and sail and spent something over a third of her time at sea. The total number of lads who joined the vessel was about five hundred, and of these about four hundred joined other vessels. The average cost to the Department per fully qualified trainee per year varied from £205 to £373. In 1922 the ship was put out of commission as an economy measure.

As to re-establishing a training-ship, the question first arises as to what sort of training should be given. Unquestionably, the sea-going training-ship and preferably a sailing-ship, with proper general educational and technical schooling, gives the best training and is in every way best for the boys; but it is the most expensive form of training. There are still in existence many harbour training-ships, but these are going out of favour, and giving place to shore institutions. The objective of practically all the home establishments, whether sea-going or not, is the training of boys and youths to become officers. The difficulty complained of in the representations which have been made to the Government is that the opportunity of going to sea is denied to a great many New Zealand boys who desire to do so, which may be an entirely separate question to that of training officers. It is actually the case in New Zealand to-day that there is a greater supply of officers and seamen and particularly the latter, than the mercantile marine can absorb, and from this position arises the difficulty with which youths desiring to go to sea are confronted. In this respect, however, our youths who desire to go to sea are in no different position to those who desire to enter other trades or callings as apprentices, where the quota of apprentices to tradesmen is restricted. It is probable that this restriction in certain avenues of employment has resulted in an increase in the numbers of those now applying for employment at sea. It is also the case that increasing numbers of trained seamen from overseas are making their homes here.

Summed up, therefore, the position appears to be that the establishment of any sort of training institution would be costly, and would result in the training of a number of youths for our mercantile marine which could absorb only a limited number of those trained.

Survey of Ships.

The following table shows the numbers 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	202	(193)
Seagoing sailing-vessels	13	(14)
Restricted-limits steamships and auxiliary-powered vessels	499	(522)
Total	714	(729)

Nineteen of these vessels had not been surveyed before. The seagoing vessels not previously surveyed by the Department are the "Foxton," "Himatangi," and "Otakou." The "Foxton" is a new motor cargo-vessel built of wood at Auckland. Her gross and registered tonnage are 224 and 99 respectively. This vessel is engaged in the coastal trade.

The "Himatangi" (ex "Coolebar") is also engaged in the coastal trade. Prior to coming to New Zealand she was trading on the Australian coast. She is a steel cargo-vessel built nineteen years ago and has a gross tonnage of 479.

The "Otakou" is the new steam-dredge owned by the Otago Harbour Board. Her dimensions are: Length, 250 ft. 4 in.; breadth, 46 ft. 2 in.; depth, 19 ft. 7 in.

Two small home-trade vessels, the "Karoro" and the "Koutunui," were converted from steam to motor vessels.

Departmental circulars relating to life-saving appliances for ships and harbour regulations, and Board of Trade circulars relating to salinometers and deck sheatings, were issued during the year.

Two hundred and sixty-three vessels were surveyed for seaworthiness and efficiency under section 226 of the Shipping and Seamen Act. There were also thirty-seven other surveys made, making a total of 300 surveys carried out in addition to the usual periodical surveys. In the previous year the total number of these additional surveys was 319.

In the majority of cases the defects necessitating survey under section 226 were due to collisions and grounding.

Cargo Safe Working-load Regulations and Tables.

Requests for copies of the "Safe Working-loads Regulations and Tables" are still coming to hand. There are only 274 copies left out of the issue of 2,000, which is an indication of value of this publication not only to shipping, but to every one concerned in the use of lifting-gear.

Registration of Shipping.

On the 31st December, 1929, there were on the register of vessels in the Dominion 71 sailing-vessels, of 8,868 tons register; 253 steamers, of 104,407 tons register; and 217 motor-vessels, of 6,242 tons register, as compared with 88 sailing-vessels, of 11,303 tons register; 250 steamers, of 93,771 tons register; and 222 motor-vessels, of 5,815 tons register, at the end of the previous year.

The number of seamen and boys employed on board was 3,805, as compared with 3,611 at the end of 1928.

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 14,568 and 14,460 respectively, as against 14,557 and 13,994 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	4,405	(4,452)	4,498	(4,547)	815	6	0	(815	16	0)
Wellington	5,860	(6,051)	5,650	(5,400)	1,022	8	0	(1,013	5	0)
Lyttelton	1,163	(1,180)	1,135	(1,127)	198	10	0	(198	4	0)
Dunedin	916	(976)	1,010	(1,013)	181	6	0	(174	10	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 £21,814 8s. 2d., as against £18,270 5s. 9d., an increase of £3,544 2s. 5d.

Examination of Marine Engineers.

During the year 214 (208) candidates were examined for marine engineers' certificates of competency at the various examination centres throughout the Dominion.

Of the 104 (97) who presented themselves for examination for first-, second-, and third-class certificates of competency for service in seagoing steamships, 17 first class, 14 second class, and 34 third class were successful, and 19 first class, 5 second class, and 15 third class failed in the examinations. The first- and second-class certificates mentioned in this paragraph are of Imperial validity.

The remainder of the candidates—110 (111) in all—were examined for certificates of competency which are valid in New Zealand only. Of these, 38, 29 of whom were successful, were examined for service in seagoing vessels propelled by some motive agent other than steam; 65, 59 of whom succeeded in the examination, for service in vessels propelled by some motive agent other than steam plying within restricted limits; and 7, 4 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.

In the course of the year the Shipping and Seamen Act was amended with the object of removing a hardship to which many who desired to become marine engineers were exposed. By the amending Act, which, having received the Royal assent, came into force on the 15th February, applicants for examination for third-class marine engineers' certificates of competency who have been unable to fulfil the requirements of the Department in respect of qualifying workshop service during their apprenticeship are enabled to perform the necessary additional service subsequent thereto.

Since the passing of the Amendment Act many who were previously debarred from being examined for third-class certificates of competency have presented themselves for examination.

Inspection of Boilers and Machinery.

Boilers and Pressure Vessels.

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

Class.	Number.
Boilers and steam-pressure vessels inspected for the first time ..	286 (398)
Air-receivers inspected for the first time	293
Total inspections of all boilers and pressure vessels	7,925 (7,721)

The Air-receiver Regulations came into force on the 1st January, 1929. Most of the air-receivers noted above as having been inspected for the first time were therefore not new ones. Inspection has shown the need for rules governing design, construction, and inspection. It has been noted with surprise that some of the new imported receivers failed to comply with authoritative standards of the country in which they were made.

The owner of a boiler was prosecuted, and a fine inflicted, for permitting it to be worked at a pressure exceeding that allowed by the certificate.

There was one boiler explosion during the year. Fortunately, no one was injured. An examination of the boiler showed that previous to the explosion the cylindrical shell plate had been fractured at the edge of the longitudinal seam. In other parts also the condition of the boiler was dangerous. The boiler was of the multitubular dry-back type, 4 ft. 6 in. in diameter and about 6 ft. 3 in. long. The longitudinal joint was a lap joint, treble riveted. The safety-valve was set to blow off at a pressure of 120 lb. per square inch. The boiler was in use on a log-hauler. It was last inspected nineteen months prior to the explosion, and the certificate which was then granted had, therefore, lapsed seven months when the explosion occurred.

Machinery.

Inspections of machinery for the year were as follows : Lifts inspected for the first time, 110 ; cranes inspected for the first time, 17 ; total number of inspections of machinery, 42,264. The total for the previous year was 39,672 inspections.

The increase in the numbers of inspections of all boilers and machinery is about 6 per cent., and this additional work has been carried out without additional assistance. The arrears of inspections are, however, considerable, and additions to the staff have been found necessary to enable the work to be kept up to date.

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		

From this statement it will be seen that the number of inspections has increased very considerably in the past ten years.

There were reported during the year four fatal and 105 non-fatal accidents. One of the fatal accidents was due to a crane-hook accidently becoming detached from a sling supporting a steel plate resting on its edge on the ground. The foreman, anticipating that the plate would fall over against a wall, ordered the hook to be lowered. The plate, however, happened to be momentarily balanced, and the hook, being relieved of the weight, slipped below the sling. The plate then fell over on the wrong side and pinned the foreman to the ground.

The second fatal accident occurred to a workman who either jumped from or was thrown off a truck which was being lowered down an incline and of which control was lost through the winchman inadvertently releasing the brake on the winch.

In the third case a man was struck on the jaw and his neck was broken by a brake-lever. No one witnessed the accident, but it is surmised that the lever had been jerked upwards by a hauling-rope which had been allowed to override a flange on the shaft to which the brake-lever was secured.

The other case was the accident to a foreman in charge of the machinery of a brickworks. He was severely mangled when he was caught between the gear-wheels of a brickmaking-machine. It is not known what was his object in approaching the gear-wheels whilst they were running. He had been instructed to see to the greasing and oiling of the machinery at the beginning of the day and at midday when it was not in motion. He had the reputation of being an exceptionally reliable foreman, and it was not anticipated that such an accident could have occured to him. The gear-wheels have now been totally enclosed.

Of the 105 non-fatal accidents reported, fourteen were not connected with machinery. Thirty-two of the remaining accidents occurred at woodworking-machines, 18 at circular saws, 8 at planing-machines, 5 at shaping-machines, and 1 at a lathe. There were 8 lift accidents. A careful investigation of each accident has been made.

Instructions relating to hoists were issued during the year, and machinery of less than 3 h.p. used for spraying fruit-trees was exempted from the provisions of the Inspection of Machinery Act.

Examinations 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, unless the circumstances are very exceptional, candidates are expected to arrange to 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: Extra first-class stationary engineer, 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 340; of this number 252 were successful and 88 failed in their examinations.

Prosecutions.

During the year legal proceedings for offences under the various statutes administered by the Department were instituted in seventy-seven cases. Prosecutions under each Act were as follows: Fisheries Act, 54; Harbours Act, 3; Inspection of Machinery Act, 9; Shipping and Seamen Act, 11.

Fisheries.

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

An important feature of this year's work of the Fisheries Branch has been the investigation into the whitebait fishery. For some time past the Department has been gathering information through available sources as to the condition of this fishery as compared with past years. From the information thus gathered, and from investigation made by officers of the Department, there can be no doubt that, speaking generally, there has been a serious depletion, and an effort must be made to conserve the fishery and, if that is possible, to restore it to something of its former plenitude. This can be achieved in only one way, and that is the adoption of regulative measures of catching. To this end draft regulations, which were really a consolidation of the various existing local regulations and suggestions for certain new regulations, were sent out to all interested parties for any suggestions they might have to offer. These replies have all been carefully studied, but they have not been particularly helpful for the reason, which will be readily understood, that most people concerned are apt to look at such questions entirely from their own point of view and express opinions accordingly. The Department can have only one point of view, and that is the preservation of the fishery, and if, as is the case, a fishery has become unduly depleted, to propose measures designed to lead to its restoration. Draft regulations have accordingly been prepared by the Chief Inspector of Fisheries and are now under consideration. As the whitebait-fishing season is now in full swing, it would not be reasonable to bring the regulations into immediate force, but they will, when finally passed, be drawn in such a way as to suspend their operation until a given date, after this season is over, but enabling those concerned to know the conditions under which fishing may be carried out next season.

Ross Dependency.

This dependency of New Zealand has attracted particular attention this year because it was used as a base for the operations of the Antarctic expedition of Commander Byrd, and also because of the increase in whaling operations carried on in its waters.

The Department was in no way connected with the Byrd expedition, except to offer such facilities as it was able to do.

As to the whaling expeditions, three floating factories and their attendant whale-catchers operated under license as follows: The "Sir James Clark Ross" and "C. A. Larsen," under license originally issued by the Imperial Government and later transferred to the administration of New Zealand, and the "Southern Princess," a British-owned expedition licensed by New Zealand.

The "Kosmos" and "N. T. Nielsen-Alonso," both Norwegian owned, held no New Zealand license, but were licensed by the Norwegian Government, as were also the "Sir James Clark Ross" and the "C. A. Larsen."

The following table shows the number of whales captured and barrels of oil taken in each of the years indicated :—

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
		11,673	902,646

* Unlicensed factories. Records have not been authenticated.

NOTE.—One barrel = 40 imperial gallons.

The average take of oil of each of the three floating factories engaged in the 1928–29 season was 61,833 barrels, while for the 1929–30 season the average for each of the five factories operating was 68,238.

The higher average per ship is accounted for mainly by the fact that the newer vessels were larger and more modern in factory and chasing equipment.

The season generally was an unusual one. In the early part what whales were caught were comparatively thin and the ice conditions were distinctly worse than previous seasons. The pack ice was impassable until a later date than usual, consequently those factories which endeavoured to force a passage through lost a great deal of fishing time and received considerable damage, the "Southern Princess" losing one of her five catchers while the "Kosmos," which early gave up the attempt, and was operating with seven very fast catchers, took by far the biggest catch. It is understood that the "Southern Princess" will not be operating in the Dependency during the coming season.

The whaling operations in the Ross Sea, the increasing number of expeditions and whales taken and the fear that the stock will be depleted at a rate greater than natural reproduction will be able to balance, has been the subject of a good deal of discussion during the past year.

Apart from the fact that whales, if not taken in the Ross Sea, will probably be taken somewhere else, the financial aspect of the matter will certainly act as a regulator to some extent. These expeditions cost a very large sum of money to fit out and operate, and a bad season, either as to sea and ice conditions, or shortage of whales, may easily result in loss so serious that the number of expeditions will be reduced or operate in other waters. There is evidence of this in the case of the "Southern Princess" whose owners, as a result of last season's experience, have decided to operate elsewhere.

The Department has been seriously concerned in the matter of preservation of the fishery ever since the first visit of an unlicensed factory in the 1926–27 season when the questions of regulating catching-capacity to stocks and compelling the extraction of oil from the whole carcass was taken up with the Home authorities. It was realized that as all the catching could be done in international waters, which were free to all, effective regulation in all necessary respects could be achieved only by international agreement. The Norwegian Government has made its own law on the subject, but this is limited practically to requiring all Norwegian vessels to be licensed and to observe certain regulations designed to prevent waste.

The question has been under consideration by the Economic Committee of the League of Nations, with the result that a committee of experts was set up and met in Geneva in the spring of this year. This committee has drawn up a draft convention for the consideration of the various Governments concerned. As this follows very much, in practical matters, on the Norwegian law, it would seem there is good ground for hoping that a definite forward step will result. It would not at this stage be appropriate to discuss the draft convention in detail except, perhaps, to say that it falls short of regulating killing-power—that is to say, regulation of the number of vessels which may engage in whaling under license; but logically that seems to be the next step to look forward to. It should be realized that there are many difficulties in the way, and by reason of the question being an international one the progress towards the end which we desire to see will not be speedily reached.

Westport Harbour.

The following statement shows the revenue and expenditure in respect of Westport Harbour for the past nine years:—

Year.	Expenditure.			Revenue.		
	£	s.	d.	£	s.	d.
1921–22	63,950	1	10	25,836	19	3
1922–23	50,738	17	5	38,700	8	1
1923–24	46,619	1	11	42,285	7	4
1924–25	44,666	14	0	50,378	11	0
1925–26	51,909	4	11	57,539	12	11
1926–27	52,769	12	6	62,976	13	10
1927–28	65,828	1	7	65,909	8	1
1928–29	68,871	13	0	64,214	5	6
1929–30	64,877	10	5	66,274	17	3

The surplus for the year under review amounted to £1,397 6s. 10d., after making full provision for all charges in the way of depreciation, interest, and sinking fund. This result must be considered satisfactory, more particularly in view of the fact that protective works and extension of breakwaters have been provided for out of revenue, the expenditure under these two headings for the past year being £4,966 13s. 5d.

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

Year.	Net Tonnage of Shipping entered.	Tonnage of Coal exported.	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

From this it will be seen that the definiency in 1921–22 was £38,113 2s. 7d. and the surplus for 1929–30, £1,397 6s. 10d., which represents on the face of it an improvement of £39,510 9s. 5d.; but to obtain a uniform basis of comparison the expenditure of £4,966 13s. 5d., representing capital works paid for out of revenue last year, should be added. The net improvement would then be £44,477 2s. 10d. Although this is very satisfactory as an indication of past achievement, the fact that the harbour is now just paying its way must not be overlooked. It would take very little in the way of an increase in expenditure or a reduction of revenue to throw the balance on the wrong side.

The bunkering trade at Westport showed a slight increase. The number of vessels which have called for bunker coal during the past five years is as follows: 1925–26, 20; 1926–27, 44; 1927–28, 51; 1928–29, 54; 1929–30, 57.

During the year under review there has been an unlimited demand for coal owing to labour trouble at the Australian mines. With the cessation of Australian supplies the mining industry in the Westport district has been given an opportunity, which will probably not arise again, of extending its trade in many directions, but the export figures for the year are very disappointing. Apart from the dislocation created by the earthquake in June, 1929, vessels calling for bunker and also for cargo coal have been unduly delayed, and have frequently had to leave port short-loaded owing to the supply being insufficient to meet the demand. A considerable number of large overseas vessels called at the port during the year, but owing to the serious delays they were subjected to it will not be surprising if the trade is lost when supplies are available elsewhere.

Critics of the administration of the port have asserted that the sole reason for delays to shipping is the insufficient depth of water on the bar. Investigation of the facts, however, shows that when there was an ample depth of water on the bar the coal-output was altogether inadequate to supply shipping demands.

Last year's experience in this connection goes to show that, no matter how keen the demand may be, the output from the mines has not been materially increased to meet it. This fact does not deter critics from pressing for additional berthage and loading-accommodation and other improvements to the harbour, regardless of what the cost may be or the limited extent to which they may be used.

Apart from the natural disabilities of an artificially created river harbour, there is an economic limit to which the Department may go in the provision of harbour facilities. Every penny of revenue from the harbour is being utilized in the maintenance and improvement of the port. The harbour finance is a self-contained "separate account," and although the Finance Act, 1921, empowers the

Department to draw on the Consolidated Fund, if necessary, the Department could not reasonably make such application in view of the present condition of that fund. In any case, the existing facilities are capable of handling at least 50 per cent. more coal than is being mined at present, and there is no indication that the output is likely to increase even if further facilities were afforded. No good purpose is served in providing for more shipping and larger vessels, when there are plenty calling now to cope with the present output.

Another factor which has a direct bearing on the complaints which have been made is the attempt to work the harbour with vessels of a draught requiring a depth on the bar which, though it may be obtained when all conditions are favourable, cannot possibly be assured under unfavourable conditions. In 1910, when the export of coal was 800,000 tons, the average net tonnage of vessels visiting the port was 575, whereas in 1929 the average net tonnage was 850, and the export of coal 625,835. Furthermore, it must be borne in mind that the use of means of power-production other than coal is greatly on the increase. Even in the districts of the Buller and Grey Coalfields considerable hydro-electric undertakings are in hand where local coal could be used, and possibly more profitably used, for the production of power.

The position generally in regard to the entrance to this harbour has not been satisfactory recently, although the suction dredge "Eileen Ward" has been employed continuously on the bar at every available opportunity, and the bucket dredge "Maui" also has been continuously employed. The cause of the trouble is due partly to the gradual accumulation of detritus adjacent to the breakwater, and partly to the phenomenal dry spell of weather in the latter half of the year, keeping the natural flow of the Buller River at an unusually low ebb.

The whole question of maintaining a satisfactory depth of water on the bar has been thoroughly investigated, and the decision has been reached that the only effective method of remedying the position is to extend the breakwaters so that the influence of the river when in fresh may be extended to the bar. No amount of dredging, within economic and practical limits will have the desired effect if weather conditions are adverse.

The extension of the breakwaters was commenced during the year, and this work is being pushed forward as expeditiously as possible.

The bucket dredge "Maui" which was purchased by the Department from the Gisborne Harbour Board in September, 1929, has been engaged for the greater part of the year in the fairway and at the berthages. It takes this vessel all her time to cope with these two areas, as it is found that siltation is now taking place at a greater rate than previously, a condition which is attributed to the following causes: (1) The land-slides caused by the severe earthquake in June, 1929; (2) the spoil being dumped into the river from the new railway works and in connection with road-restoration.

The track to Organ's Island has been repaired to enable a further extension of the protective wall to be carried out, and 1,969 tons of stone were deposited at McPadden's. The fencing of the willow reserve at Hanna's was completed. The willows planted in this reserve are doing well, and should now be able to withstand any reasonable flood.

The new pilot-launch, which was specially designed for the harbour-work at Westport, was delivered in July, 1929. This vessel has proved an excellent pilot-boat, being capable of crossing the bar in all weathers.

The electric coal-loading crane, which arrived in June, 1929, was recently put into commission, and is a first-class machine. Coal can be loaded without difficulty at any state of the tide into any vessel visiting the port. It is understood that there is some fault in the supply of power, but doubtless this will be overcome.

Additional equipment has been provided at the workshops, and the plant generally has been well maintained.

G. C. Godfrey, Secretary.

FISHERIES.

Sir,— 8th August, 1930.

I have the honour to submit my report for the year ending 31st March, 1930.

Returns from the various fishing centres have been collected as usual, and assembled in statistical form (see Tables I and II).

By summarizing this information the total amount of wet fish landed in the Dominion for the year is shown to be 367,647 cwt., valued at £449,440.

The value of the total yield of the shell-fisheries amounted to £38,663, made up as follows:—

		Value. £
Dredge oysters	39,331 sacks	24,582
Rock-oysters	6,219 sacks	7,152
Mussels	9,037 sacks	2,833
Crayfish*	2,047 cwt. = 2,675 sacks	4,096

Separate returns of landings of mussels and crayfish were unobtainable for some of the ports, so that the figures for these kinds are incomplete.

Products to the value of £8,901 were obtained from the whaling operations in New Zealand coastal waters.

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* Crayfish returns have been reduced to a common denominator by using the following equivalents: 1 sack = 5 dozen = 85·7 lb.; 1 case (double benzine-box) = 3½ dozen = 60 lb.

The total value of the produce of the Dominion's fisheries for the year thus amounts to £497,004.

Unfortunately, we are still without the means of obtaining fishery statistics in a systematic and comprehensive manner, and it is to be observed that the returns which reach this office vary considerably in their approximation to accuracy. By issuing log-books to individual skippers and by obtaining records from fishing-vessel owners or fish depots and markets endeavours have been made to supplement and to check the information derived from the annual returns of local Inspectors. The facts provided by such data afford the only material evidence upon fishery conditions which we can acquire, and those records have already proved to be extremely useful to us in considering various fishery problems. For this reason a great deal of time and attention, which could ill be spared from other duties, has been devoted to tabulating and summarizing material of this nature. Being heterogeneous, it is difficult to digest into departmental records. For the same reason, and because it is special and more or less confidential, it is not suitable for publication. We can only make the best use of opportunities for obtaining it, though compared with systematically collected statistics it is like catching rain-water in buckets instead of using a properly engineered water-supply system.

That a uniform system of collecting and collating fishery statistics is an urgent need will be appreciated fully if one endeavours to learn anything from the figures published as statistics in the Annual Reports of the Marine Department for the last fifteen years. We require to know, and to place on record for the guidance of future administration, the following facts with regard to the fisheries :—

(1) The approximate quantity of each of the more important kinds of fish landed each year for the principal ports :
(2) The variations in production in different seasons and different regions :
(3) The quantities of fish caught by each of the principal methods of fishing.

This information can only be obtained by the total abolition of our existing plan of collecting annual returns, and replacing it with a method of collecting more frequent and more detailed statistics. This will call for more work on the part of our representatives at the ports, whose present exiguous pay should therefore be increased. It will also provide work for an extra statistical clerk at head-quarters. In a year when retrenchment and economy are necessary I should not urge this development but for the fact that it has already been too long delayed and that the work is such that being deferred its fruits are lost for ever.

Possibly the conditions in New Zealand, with its varied methods of landing and distributing fish and its scattered sources of supply, are somewhat difficult to square with a uniform system of fishery returns. In some places the best source of information would be the buyer who purchases the fish when first landed. I was at first inclined to advocate this method of obtaining data, which is the system used in California ; but on further consideration it would appear most satisfactory to require simple returns of the kinds, quantities, and value of the fish landed, and the method of fishing, from each licensed fishing-vessel owner (or skipper) and to collect such returns monthly. Proposals to give effect to such a scheme have been submitted. The Minister of Marine has power under the Fishery Act of 1908 to make regulations compelling fishing-vessel owners (but not fish-buyers) to make such returns. I am quite confident that resort to penal measures will be unnecessary or will play a very small part in the scheme in practice. The information is necessary for that proper understanding of the fisheries which is required for their rational administration and, indeed, for their rational development, both of which are essential to the well-being of the fisheries and those engaged in the industry. There will be difficulties to overcome before the scheme can work smoothly and efficiently. The principal condition for success is an attitude of mutual helpfulness between those working in the industry and those working for the administration. Generally speaking, I believe this attitude exists, although usually the occasions for intercourse between fishermen and Fishery Inspectors are limited to those connected with the enforcement of regulations. The scheme for the collection of statistics would facilitate and increase opportunities for intercourse between fishermen and officials to the benefit of the industry and the Department.

The interest and value of a statistical record of fishery production is not, however, confined to the administrative point of view, which is concerned mainly with measures for conservation. It has a very real value for those interested in industrial developments. Very few people will be inclined to invest capital in a concern unless they are provided with data which give them information as to its probable productivity. Mining operations are organized on the basis of surveys and assays ; agricultural undertakings with careful regard to the yield per acre. But who knows anything about the yield per unit area of the fishing-grounds of New Zealand ? Accounts and pictures of occasional big catches tickle the idle fancy of the newspaper reader, but the person who is interested in a business sense demands averages. The fluctuations in a fishery are the most intriguing and embarrassing of all the difficult problems associated with the industry, and their significance can only be appreciated as elucidated by statistical treatment.

I may conclude these remarks by referring to actual cases showing how enterprise has been foiled and impeded by the lack of statistical information. The question of establishing a fish-reduction plant for the purpose of making fish-meal and oil from offal at a certain port is raised. What capital will be required ? It depends on the size of the plant, and this depends upon the quantity and the frequency of the landings of fish. Not having the necessary statistical data for reference, the question is left in the air, and the enterprise thwarted. The same difficulty is encountered in discussing projects for the better preservation of fish. The question of improved systems of transport similarly turns upon consideration of quantities to be handled. Without the fundamental data no organized scheme is possible, and the trader struggles along on the narrow and out-of-date lines of individualistic industry.

Whether one accepts the view that our fisheries are capable of considerably increased exploitation or—which I fear is much nearer the truth—that their potentialities are comparatively limited and permanent damage by depletion a possibility against which all precautions should be taken, the importance of a statistical study of conditions must in either case be recognized.

With these apologia for the limitations of the statistical part of this report and adumbration of improvements for the future, I pass on to deal with the main features of the history of the fishery conditions for the year.

Some improvement on the previous year's production appears to be shown for the fisheries of the Dominion as a whole. Too much significance cannot be attached to the figures in Table II for reasons already touched upon, but it may be said that in most cases these are borne out by general knowledge of the local conditions. The landings for Auckland (for which port our data may be taken as very closely approximating to accuracy) show an appreciable rise compared with the previous year which, in view of the increased restrictions placed upon trawling and Danish seining, is a matter for satisfaction. There is still, however, a decline as compared with the production for 1927–28. Fewer snapper were caught during the schooling season, owing partly to the boisterous weather of this summer and partly to the abnormal distribution of the shoals, which was doubtless an effect of the abnormal climatic conditions. The Danish seining vessels with the greatest range and best capacity for working in bad weather brought in the most consistently good catches throughout the year. Steam trawlers, being less affected by adverse weather, were the most regular in their supplies. They divided their operations between the grounds in the Bay of Plenty, off the west coast, and in the outer part of the Hauraki Gulf. At no time were unusually big catches made by the trawlers, and it would appear that they had as much as they could do to keep their market supplied. It seems clear, therefore, that restrictions on this method of fishing have gone as far as is consistent with operating on a profitable scale under existing methods.

Snapper supplies were generally satisfactory, except when weather prevented the boats from getting to the grounds.

A particularly good flat-fish season was experienced in the spring months by Danish seiners working mainly on the "Dab Patch" (between Ponui and Deadman Point). Rough weather was the only deterrent to good fishing, but the spring gales were less in evidence than usual. This fishery is prosecuted at the expense of spawning aggregations of flounders and dabs, and therefore requires careful watching both from the economic and the biological aspect.

The landings of fish at Thames have undergone a welcome improvement after the depression of the previous year. This has been effected very largely by the change of attitude which has at last been shown towards the use of the Danish seine. Men who had opposed this method of fishing from its inception have now recognized that the old-established method of fishing with set-nets is less satisfactory for providing a fairly continuous supply of fish and they have changed over to Danish seining and to making longer voyages. By this means, and by a greater attention to long lining on the outer grounds when the seasonal conditions call for it, the fish supplies to Thames have been made to show a much desired improvement.

The fish distributors of Thames continue to obtain supplies of fish (especially snapper) overland from Mercury Bay. The fact indicates progress and development, but it may be observed that the conditions under which some of the fish is conveyed by motor-lorry are by no means calculated to bring to the consumer an article of first quality. It is to be hoped that the trade will soon be developed to such dimensions that a modern method of handling the fish and storing it for transport may be adopted. Both fishermen and distributors would be the gainers thereby.

The considerable increase shown in the landings of fish at Wellington is to be attributed partly to the fact that two large steam-trawlers now regularly work from the port. But it is also due to the fact that data have been collected from a larger number of sources. The local Inspector reports that the fishing on the whole has been below average owing to the prevalence of north-westerly gales. Wellington fish-supplies are obtained from steam-trawler catches, from the Island Bay fleet of long-liners, and from various net and line fishermen in the vicinity of Wellington who send supplies to the market by rail or by steamer. A great deal of fish goes direct from producer to retailer and some proportion is sent up country. Returns of a statistical kind are thus very difficult to collect and classify in the absence of a standardized system.

The operations of the Napier trawling fleet in Hawke's Bay, favoured by an absence of bad weather, were on the whole attended by satisfactory results. From October to March flat fish were reported to be more plentiful than in any year since 1921–22. With increased attention being paid to flat fish on the inshore grounds, the landings of round fish showed a decided falling off.

The southern fisheries have shown a marked deterioration this year. With regard to the Otago ports line-fishing for groper has been especially disappointing, more particularly on the nearer grounds. This has stimulated several fishermen to adopt the long-line method of fishing and to proceed farther afield, but it has also resulted in others seeking different employment for a time. Trawlers have done somewhat better, good catches of flat fish being made in fine weather, but fair or poor fishing was the usual rule. One owner tried Danish seining unsuccessfully. Inshore fishing with seines has been less successful than usual.

The sardine-fisheries of the Hauraki Gulf noticed in last year's report are still in the tentative stage, and so far as is known there are no noteworthy developments to report.

Rock-oysters.

Picking for the 1929 season began on the 27th June, and closed on the 11th October. The number of sacks of oysters taken from the beds in the different areas was as follows: Bay of Islands, 2,651 (including 21 from Whangaruru); Whangarei, 309; Kaipara, 818; Hauraki Gulf, 2,009 (Takatu

to Gull Point, 433; South Shore, Tamaki Strait, 42; Kawau, 65; Rakino, 162; Rangitoto, 258; Motutapu, 221; Motuihi, 9; Waiheke, 470; Ponui, 333; Pakatoa and Rotoroa, 16); Coromandel, 341; Great Barrier Island, 91: total, 6,219 sacks; value, £7,150.

There has been so little spawning among the oysters on the beds in the Hauraki Gulf and the Bay of Islands during the summer 1929–30 that it may be said that for practical purposes reproduction has failed to take place. Certain individual oysters examined at the beginning of November in the Bay of Islands appeared to be on the point of spawning, but no sign of reproduction having taken place was noticed as late as the middle of February, and it was feared that they might spawn so late in autumn as to be in poor condition at the usual date for the opening of the picking season. The vast majority, however, do not appear to have spawned at all. In the Kaipara there is evidence of a general spawning having taken place during the summer or autumn, but it is too early to say how far the fixing of young has been successful. This difference between the east and west coasts is doubtless due to the higher temperature of the water on the Tasman Sea side, as to which further details will be given in another place. The wet, cold, and boisterous weather experienced in December, January, and part of February has undoubtedly been the cause of the general failure of oyster reproduction.

Oyster-cultivation.

The cultivation work carried out during the year is summarized in the table given below:—

Area.	Number of "Borers" destroyed.	High-water Oyster-rock removed.	Other Work.	Cost.
		Sq. yds.		£ s. d.
I. Bay of Islands	943,500	4,648	5,985 "pupu" destroyed	231 8 4
II. Whangarei Harbour ..	263,500	602	80 sq. yds. of dead shell cleaned from rocks	19 1 8
III. Kaipara Harbour ..	1,892,000	12,244	40 yds. of capstone renewed; 5,110 "pupu" destroyed	267 11 8
IV. Takatu to Gull Point (with Mahurangi Harbour)	1,014,000	150	360 yds. new rock walls; 160 yds. capstones renewed; 300 sq. yds. of dead shell removed	59 13 4
VI. Coromandel Coast ..	1,280,500	..	..	64 0 6
VII. Kawau	91,000	40	270 yds. of new rock wall; 850 yds. capstones renewed	30 0 0
XIII. Waiheke	495,000	200	450 yds. capstones; 300 sq. yds. rock cleared of weed	43 0 0
XIV. Ponui	178,000	..	..	10 5 0
XVI. Great Barrier Island ..	209,000	1,920	95 yds. new wall; 775 yds. capstones renewed	39 13 0
Totals ..	6,366,500	19,804		764 13 6

A great effort was again made to get rid of the "borer" pest which is still so abundant as to take considerable toll of young oysters. When the beds are densely stocked with young oysters the "thinning" thus effected may be comparatively negligible, but with sparse reproduction the "borers" count as a very considerable adverse factor. A system of paying borer pickers by contract has resulted in a substantial increase in the number destroyed without unduly adding to the cost; but this method is not everywhere applicable. In addition to the common borer (*Thais scobina*), which is small in size but abundant in numbers, a further gastropod enemy of the oyster is being dealt with. This is the large whelk-like mollusc *Thais succincta*, commonly known by its Maori name "pupu," which is able to open an oyster by muscular suction. Over 11,000 of these were gathered and destroyed during the season.

Dredge Oysters.

The fleet of oyster-dredgers at the Bluff has been maintained at the same number (five vessels) as the previous year, but with a slight increase of efficiency. The total landings for the season amounted to 39,331 sacks, an increase of 538 sacks on the previous season's total. The quality of the oysters was excellent; but occasionally an appreciable number of oysters too small to represent economical exploitation found their way to the market, and it is a matter for consideration whether it would not be advisable to alter the present legal size-limit of $1\frac{3}{4}$ in. to 2 in.

Toheroas.

The production of canned products from the toheroa-beds of the Ahipara (Ninety-mile) Beach and the North Kaipara Beach shows an increase on the preceding year's output. A total of 6,532 cases, valued at £12,442, has been packed during the past season. Although the main beds are well stocked with large toheroas, a somewhat alarming scarcity of the younger generations was noted early in the year. It has subsequently been reported from the Ahipara Beach that a great abundance of young has appeared since the summer of 1929–30. This good propagation is probably due to the prevalence of cool and damp weather this summer.

It may be mentioned in passing that this species of bivalve is known to occur in the following localities: Ahipara (Ninety-mile) Beach, North Kaipara Beach (also at certain parts of the coast in between these two), Muriwai Beach, Otaki Beach, Ohope Beach (Bay of Plenty), near Palmerston South (*fide* Professor Benham), Riverton Beach, Te Waewae Bay.

Our fund of information about this subject—the extent of the existing stocks and the variations in propagation, the demands made by exploitation upon the stock, and the essential facts of its life-history—is still too small to serve as a basis for ideal administration or for rational exploitation. More extensive as well as more intensive surveys are desirable, but cannot be carried out with our available staff. Apart from the taking of toheroas for canning by the licensed lease-holders, there is a certain amount of intermittent commercial exploitation about which we know little or nothing in quantitative terms. The prescription of a licensing system for all who take toheroas for purposes of sale and the requirement of returns of quantities taken by licensees would be a desirable measure.

Mussels.

A similar system should, I consider, be applied to the commercial exploitation of mussels, which is a profitable and expanding branch of the fishing industry in some districts. In certain localities mussel-beds have already been worked out by commercial operations about which the Department had received no information until complaints were made regarding the depletion of the stocks.

The returns show that 9,037 sacks of mussels valued at £2,833 were marketed during the year. The returns on which the figures were based are by no means exhaustive, and the total figure must be considerably higher.

Crayfish.

Among the returns of fish-landings are included records of the marketing of 2,047 cwt. of crayfish, valued at £4,096. This fishery is carried on at many different and in some cases rather remote localities. Owing to this fact and to the lack of means for collecting proper fishery statistics, these figures are by no means exhaustive. Up to the present the catching of crayfish has been carried on without any administrative control whatever. There is no legal size-limit, or close season, or prescription of gear which may be used for fishing. In most places the fishing is not continuous, however, and it is not carried on with any great degree of intensity except in close proximity to the markets of the larger cities. It is therefore probable that the lack of regulation does no harm. These shell-fish are canned occasionally, but as yet there are no established canneries for crayfish alone, although adumbrations of such enterprises are occasionally brought to our notice. From the commercial point of view the chief difficulty appears to be the lack of certainty about getting steady supplies of raw material at a price that would ensure profitable working. From the administrative aspect—and this has an important commercial significance too, although prospective crayfish-canners do not seem fully to appreciate the point—it is necessary to recognize that there is a doubt as to how long a local stock of crayfish would stand continuous exploitation before it became depleted. Too little is known as to the density of distribution, the rate of propagation and the growth-rate of this species to enable one to express any definite views on this point. The sooner statistical and biological data on this subject are available the sooner we shall be in a position to advise with due insight on questions of industrial development. Under present conditions we can only gather information which is second-hand and unconfirmed.

Quinnat Salmon.

Mr. C. L. Ayson, in charge of the hatchery at Hakataramea, reported that the first salmon taken in the trap on the Hakataramea River in the 1929 spawning season was obtained on the 24th April, about a week after the construction of the rack. The last fish was obtained on the 11th June when, owing to a high flood in the river, it was considered advisable to remove the rack. The outlet of the Hakataramea River was, as during the previous season, unfavourable for attracting big runs of salmon, as it entered a small branch of the Waitaki River which itself flowed down the river-bed for at least a mile before entering the main stream. Notwithstanding this, the number of ova collected was up to the average; and Mr. Ayson expressed his conviction that a record run of salmon would have been seen in the Hakataramea but for the unfavourable conditions above mentioned. He states that the run of salmon in the Waitaki River and its upper tributaries was greater than ever before. The fish were of a larger size than in the previous season and in good condition. The eggs and alevins hatched from them were particularly strong and healthy. The total number of eggs collected was 1,378,500; 600,000 were sent to the Maori Creek hatchery for liberation in the waters of the Wairau River (Marlborough), 225,000 were sent to the Westland Acclimatization Society for liberation in Hokitika waters, 250,000 were sent to the Government of Tasmania. The balance were hatched out and liberated in the Hakataramea River, with the exception of 19,000, which were kept for rearing in the ponds.

It would appear that the run of spawning fish in the Waitaki and its tributaries was more impressive in point of numbers than might have been anticipated from the numbers of fish observed in the Canterbury Rivers (which are the favourite angling-waters) during the fishing-season preceding. Both anglers' reports (as noted in last year's report) and the observations on fish taken in the hatchery trap agreed as to the predominance of large and well-conditioned fish.

The run of quinnat salmon for the 1930 season has taken place under quite exceptional climatic conditions and doubtless these have had their effects both on the catches made by anglers and on the movements of the fish and the consequent location of spawning beds. With regard to both these points, however, our information is not so complete as one would desire.

The rivers most frequented by anglers—namely, the Rangitata, Rakaia, and Waimakariri—have not produced very good catches this year compared with what has been the case for the previous three or four years. The exceptional floods of this summer, which lasted until February, tended to prevent both observation of fish and successful fishing of the earliest runs. Then came the long drought which, broken only by a few days of spate at the end of February, prevailed for the rest of the season. With the clearing and falling of the rivers in March there were some good runs of fish

and individual cases of very successful angling. The main runs in the Canterbury rivers apparently ended before March was out, and very few fish were taken in April. In the Waitaki River, on the other hand, where angling was prosecuted with more success than in any previous season, fair numbers of fish were taken near the mouth in the first half of April and the runs continued intermittently till the end of this month.

Our records of catches of quinnat salmon are confined to the returns made by the holders of licenses permitting the sale of rod-caught salmon who represent a very small fraction of the total number of quinnat-salmon anglers, although perhaps they are the most continuous in their operations, and on that account a satisfactory source of statistical information as to the productivity of the fishing.

The following table gives in summary form the figures obtained from these returns for the principal fishing rivers.

——	Males.	Females.	Sex not given.	Total.
Waimakariri River, 23/2/30 to 25/4/30 (eleven rods)—				
Number of fish caught	60	90	11	161
Weight of fish, in pounds	691	1,210	130	2,031
Average weight, in pounds	11·5	13·4	11·8	14·7
Rakaia River, 16/2/30 to 15/4/30 (nine rods)—				
Number of fish caught	148	110	16	274
Weight of fish, in pounds	2,246	1,589	205	4,040
Average weight, in pounds	15·1	14·4	12·8	14·7
Rangitata River, 12/2/30 to 8/4/30 (seven rods)—				
Number of fish caught	37	38	43	118
Weight of fish, in pounds	605	555	601	1,761
Average weight, in pounds	16·4	14·6	14·0	14·9
Waitaki River, 21/3/30 to 11/5/30 (four rods)—				
Number of fish caught	63	28	..	91
Weight of fish, in pounds	1,106	492	..	1,598
Average weight, in pounds	17·6	17·6	..	17·6
Combined rivers, 12/2/30 to 11/5/30 (thirty-one rods)—				
Number of fish caught	308	266	70	644
Weight of fish, in pounds	4,648	3,846	936	9,430
Average weight, in pounds	15·1	14·5	13·4	14·6

By comparing this table with the one prepared from similar returns last year it would appear that more fish were taken by the holders of selling licenses from the Waimakariri and the Rakaia and fewer from the Rangitata than in the 1929 season. In general, however, it seems certain that there were fewer fish caught and fewer fish to catch in the main Canterbury rivers this year than last. The Rangitata run, which was commented on as " the worst for years," may have been also affected by the partial closure of the mouth of the river by shifting of shingle to which it is occasionaby liable ; but it seems probable that this was only a minor factor.

Fishing in the Waitaki was more successful than it has been in previous years. Probably this was entirely a question of the phenomenal lowness of the river which would tend to delay the ascent of the salmon to the tributary streams and would make suitable fishing pools in the lower reaches more accessible.

A large proportion of small males was a characteristic of this year's runs, though there were a few fish caught which exceeded 30 lb. It was remarked that the eating quality of the fish was excellent this season. There was also a much smaller proportion of scarred fish among the catches than usual.

Atlantic Salmon.

For the capture of ripe fish for the production of ova for the hatchery at Te Anau the usual rack was placed in the Upokororo River on the 23rd March, 1929. The first fish were taken on the 27th March, but they did not appear in considerable numbers until the river rose on the 8th May, when 144 fish were taken in the three following days. Before the next flood over 300 fish were counted lying in the pools below the bridge, which were expected to move up into the trap with the next rise of the river. When on the 5th June the flood came the river rose so rapidly that practically all the fish got past the rack. After that only odd fish were taken. The last capture was on the 7th August, when, with a heavy flood in the river, the trap was taken out. The total number of eggs collected was 374,000 of which 210,000 were sent to Kakahi for liberation in the Wanganui River system and 153,000 were handed over to the Southland Acclimatization Society for the stocking of the Waiau system.

As the result of discussion with the Council of the Southland Acclimatization Society the decision has been made that in future not more than 50 per cent. of the ova taken from Waiau salmon should be sent out of the Waiau system. It seems evident that the salmon stock here cannot be expected to withstand the demands made by the greatly increased fishing in Lake Te Anau, and also by the abstraction of practically all the products of artificial culture, as has been the case for a succession of years. I am of opinion that this principle of restoring to the parent waters 50 per cent. of the ova taken by stripping for hatchery purposes is one that should be followed in most cases, but especially where there is evidence of comparatively little natural reproduction in the stream from which the parent fish are taken.

The chief points of interest about the 1929–30 fishing season appear to be as follows. Early in the season good catches were frequently made by trolling in the usual place at the outlet of the Waiau River from Lake Te Anau. Later in the season this fishing became somewhat uncertain and blank fishing days were not infrequently experienced. The practice of fishing pools in the river between Te Anau and Manapouri, which had been tentatively tried with some success the previous year, has been further developed, and has frequently given very satisfactory results. It is hoped that this more interesting and more sporting method of taking Atlantic salmon may be further developed and facilitated.

The total catch of Atlantic salmon during the fishing season is estimated at between 1,000 and 1,200. Increased catches of salmon in the tidal waters of the Waiau River have been reported at the beginning of this season. It would thus appear that more salmon are running up from the sea.

The statement has been frequently made during the past fishing-season that the Te Anau salmon are deteriorating in condition. Apparently the average size of fish caught is below that for previous years; precise data are unfortunately lacking. Very conflicting views are held as to the probable cause. Some think there are too many salmon in Te Anau for the food-supplies; others hold that the declining sizes are evidences of overfishing at the same spot—the "champions of the pool" being allowed a very brief period of domination before they are hauled out by an angler: the best feeding-station (and therefore the best fishing-place) thus being occupied by diminishing sizes of fish. This seems to be a cogent explanation of, at any rate, some part of the observed facts. The food-supplies of the lake and river—and there is overwhelming evidence that many, though not all, Atlantic salmon do feed and grow to maturity in fresh water in New Zealand—are, of course, subject to variation, and indeed are liable to depletion if their natural propagation is exceeded by the numbers abstracted from the stock by enemy depredations. Both food and fishing will each factor in affecting the average sizes of fish, but it is obvious that underfeeding would be mitigated by overfishing. The only conclusion we can come to is that many more scientific observations—I may include here the observations of anglers so long as they are systematic and comprehensive—are necessary before any satisfactory conclusion or any practical policy can confidently be adopted with regard to the administration and development of the Atlantic salmon fishing.

Attention may be drawn to one unquestionable fact, and that is that a considerable proportion of the fish taken in the early part of the fishing-season are kelts (spent fish) and inferior both for sport and for eating. It has been suggested that no fishing in the lake should be allowed in October, and that the River Upokororo and an area off its mouth should be closed for a longer period. This, I think, is a desirable measure which should be brought about before next fishing-season opens. The river and its threshold should also be a sanctuary during the later portion of the fishing-season so that ripe or nearly ripe fish may be saved for reproduction. Since ripe fish are to be found throughout the period from April to the end of August the problem of protecting gravid or spent individuals is admittedly difficult. It is probable that the early spawning individuals are of most value and should be preserved for propagation as far as possible. This is a question, however, which calls for special investigation. Our information about the occurrence and habits of the species is still too limited to enable us to form any comprehensive ideas as to the present conditions either from the biological or fishing standpoint. The collection of scales and other biological material is being continued, and such observations are made as there are opportunities to make. In this connection we must acknowledge our indebtedness to the Southland Acclimatization Society's officers for co-operation. To obtain anything like complete light on salmon problems or to arrive at anything like definite conclusions needs systematic and sustained work, and it is to be hoped that this will be made possible in the near future.

The importations of ova made in 1908 to 1911 to the number of approximately two million, of which the fry from about 1,800,000 were introduced into the Upokororo River, served to stock this river and Lake Te Anau into which it empties itself, and in no other river but the Upokororo has there yet been an appreciable run of spawning fish, although odd fish have been known to run into the Clinton at the north end of Te Anau, rather more into the Eglinton which enters the lake 17 miles north from the mouth of the Upokororo, and there have been one or two fish taken in trout-traps at the mouths of the Maroroa and Wairaki, which flow into the Waiau between Manapouri and the sea. On the whole, it may be said that the rule of returning to parent river has been observed, and there has been no tendency for the species to spread over the Waiau system generally. In future, with the co-operation of the Southland Acclimatization Society, it is intended to extend the stock more generally throughout the Waiau watershed, and not leave the Upokororo alone to provide for propagation and the nurture of the young fry and parr stages. It seems doubtful whether this can be done expeditiously with the ova obtainable for cultural operations from the existing stock, especially if any further consignments are to be sent north. And in view of the importance of demonstrating conclusively whether acclimatization in the Wanganui River is possible or not, I think the planting operations in that system should be continued over a ten-year period (to 1932) provided that 50 per cent. of the Te Anau hatchery output will afford a quota of sufficient numbers to warrant the transportation. I would recommend that at the earliest opportunity a further importation of Atlantic salmon ova from Britain should be made and that the resultant fry should be introduced into the Waiau system for the recruitment of that stock which could then be used for the stocking of further rivers. Those for which successful acclimatization of *Salmo salar* appears most probable are the rivers flowing into the sea on the south and east coasts of the South Island.

Whitebait.

In last year's report the whitebait-fishing season of 1928 was summed up as generally poor. Our sources of reliable information as to these widely distributed fisheries are not so representative as could be desired, but, so far as our information goes, it is evident that the 1929 season was better than the previous one. This applies particularly to the West Coast fisheries, where, although the actual fishing-season was short, some very big runs of whitebait were seen and heavy catches secured. In the Manawatu River the season was a very poor one this year.

The following shows the returns of quantities caught at certain centres for the past three seasons. Unfortunately there are at present no means of making these returns more comprehensive.

——	1927.	1928.	1929.
	Cwt.	Cwt.	Cwt.
Hokitika and neighbourhood	925	463	1,319
Greymouth and neighbourhood	160	100	252
Westport and neighbourhood	538	600	No return obtained.
Kaiapoi and neighbourhood	361	85	188

In last year's report I dealt at some length on the condition of the whitebait fisheries from the aspect of information obtained from acclimatization societies and from Inspectors of Fisheries and others interested in the subject. On the basis of this information certain modifications of the regulations were tentatively recommended in the direction of keeping the administration in closer touch with the fisheries by setting up a licensing system and by prescribing a close season to ensure more escapement from fishing-operations in order to increase the breeding-stocks. It was pointed out in that report that our knowledge of the practices and the production of these fisheries was not as exact nor as complete as was desirable, and one of the principal objects of the recommended changes in regulations was designed to remedy this deficiency.

In the past year the information previously obtained has been added to and extended. In the absence of a scheme for obtaining strictly statistical data our understanding of the industrial aspect of the whitebait fisheries stands very much where it did. The abnormally good whitebait season on the West Coast in 1929 has affected the point of view of most people who are interested in that fishery. It has encouraged a tendency to swing towards optimism and *laissez faire* just as the bad season of the previous year encouraged pessimism and the "something must be done" attitude. This is a natural human reaction, but it is not good from the point of view of administration where our policies must be guided and governed by average conditions and the general trend. Our primary policy is to ascertain what these are, and the aim of the whitebait regulations should be principally directed towards this object. In the past the tendency has been to regulate first under the compulsion of popular clamour and to leave fundamental investigations for another day. Rational fishery regulations must be based upon (1) comprehensive knowledge of the practices and production of the fishing; and (2) comprehensive knowledge of the life-history of the fish. It should be the primary function of the Fisheries Department to obtain and make use of both these classes of information, and in order to function properly it should be staffed and equipped for these purposes. Though very little advance has been made towards this ideal up to the present, progressive work is being done to perfect our knowledge of the fundamentals referred to above. In connection with the natural history of the whitebait a very definite advance has been made by means of the excellent work carried out by Captain Hayes with regard to the spawning of the whitebait in the Manawatu River, which has thrown a new and important light on the subject. A general account of this work is given under the head of "Scientific Investigations." (See p. 20.)

Pollution.

There is in the Fisheries Act of 1908 a section which was designed to prevent the pollution of rivers and streams into which trout or salmon had been introduced. Allowing sawdust to get into such waters, which is definitely known to be deleterious to fish-life and to the life of organisms on which fish feed, was expressly mentioned in the Act under prohibited forms of pollution, and this same prohibition is repeated in most, if not all, of the regulations in force under the authority of various acclimatization societies. Cases have too frequently come to my notice where this law is ignored in a way which in some cases amounts to deliberate defiance. Individual sawmillers apparently take the view that in the face of such feeble enforcement as the Department and certain acclimatization societies have been able to effect, it is cheaper to risk an occasional small fine than to make provision, which the majority of sawmillers do make, for the disposal of their sawdust otherwise than by pouring it into a stream. I wish to state most emphatically that this sort of thing should not be tolerated. Not only is it on the one hand defiance of statutory authority, and on the other a lame or half-hearted carrying-out of duties statutorily delegated; it is making distinction between one party and another to the benefit of the non-law-abiding, and it is piling up trouble for the future. The Department should be in a position to take, and should take, more initiative in these cases, and should not leave enforcement to local authorities at all. Though at the present day there remain very few waters which have not been stocked with trout or salmon, there appears to be no rational cause why the protection of streams from pollution should be limited to such waters. The native species are equally in need of protection: the whitebait fishery, for instance, is of considerable economic importance.

The pollution law might very well be revised, but meanwhile there is real need for its enforcement as it stands.

WHALING.

At the Whangamumu base one steamer, working with two tenders, was engaged in whaling. Eleven men were employed at sea and fourteen ashore. In the course of the season fifty-three humpbacks were taken, which yielded 241 tons of oil, valued at £3,856, and 40 tons of bone-meal, &c., valued at £245.

In the Picton Sounds four oil-engined chasers and a recently acquired parent steamship were engaged. The industry employed eight men at sea and eleven men ashore. The total catch for the season was forty-nine humpbacks, which produced 240 tons of oil, valued at £4,800.

Off Whangamumu the first whale of the season was taken on 12th June and the last on 18th November. In the Picton Sound operations the corresponding dates were the 15th June and the 15th August.

SCIENTIFIC INVESTIGATIONS.

The task of collating data of a statistical nature obtained from fishermen's log-books, records of the operations of the Auckland trawlers, and returns of catches sent to Wellington market, has occupied a great deal of the attention of the Marine Biologist, which, if the necessary clerical assistance had been available, might have been devoted to purely investigational pursuits. It is advantageous to have such work dealt with by one who has had a scientific training and who is possessed of as sound a technical knowledge of fishery matters as is Mr. Young; but, nevertheless, it would have been better if the more mechanical and routine part of this work could have been dealt with by a clerical assistant. Such tasks up to the present have been voluntarily undertaken, because we are haunted by the expectation of the recurrence of the kind of controversial problem which has arisen before, more particularly in connection with the Hauraki Gulf fisheries, and which can only be tackled satisfactorily on the ground of concrete facts. To avoid a repetition of those sterile inquiries and conferences, where opposing partisan statements and opinions are taken as the only available evidence on which to base administrative measures, is one of the objects of our endeavours to bring systematically ascertained facts and scientific knowledge to bear upon fishery problems.

We have much uphill work to undertake and carry out before we can bring about this desired state of affairs. The fisheries staff is doing the best it can under the circumstances, but its functions are too many-sided and too much concerned with matters of casual occurrence for the highest efficiency or for real economy. We need a more specialized organization which at present is lacking. In Captain L. Hayes, at present attached to the fisheries staff in a temporary clerical capacity, whose discoveries in connection with the natural history of the whitebait will be referred to later on, the Department possesses an exceptionally keen and capable naturalist who has been a very valuable asset to the Fisheries Branch. But his employment as a field naturalist involves complications in connection with routine office-work.

Oysters.

The greater part of the Marine Biologist's "field" work has been concerned with systematic inspections and biological observations on the rock-oyster beds, with a view to finding out the relation between certain factors in the environment and the growth and reproduction of these molluscs. Experiments in oyster-culture on the tray system and by other methods have been continued and extended to fresh localities. The results of the tray experiments so far go to show that the removal of high-water rock or mangrove oysters to trays at lower levels (nearer low-water mark) results in great improvement in shell-growth. We have found, however, that fattening does not take place with the same rapidity as with oysters on the natural rock at a similar tide-level. Our tray oysters have not come to good edible condition till the summer months, which is too late for our oyster season. The rapid fattening of oysters cultivated by this method in such localities as the Hawkesbury River, New South Wales, is of considerable value to the oyster-farmer. The longer period which has been found necessary for fattening in our experiments is obviously an economic drawback. If late oysters in sufficient quantities could be marketed by utilizing tray cultivation on a commercial scale, however, it might be an advantage to the trade in prolonging the marketing-season. It should be noted that the summer weather in the North has been so unseasonable during the period of our experiments that, as Mr. Young says, one hesitates to use data collected under such abnormal conditions. The different factors affecting the growth of oysters on our trays have not yet been conclusively elucidated. It is probable that temperature is the dominant factor; and it may yet prove that different results might be obtained under the genial climatic conditions which one is told used to be experienced in Auckland in the past, but which have been the exception and not the rule of late years.

Under the Marine Biologist's supervision a series of standard slabs of concrete have been fixed at selected positions in the different oyster areas in order that definite observations may be made periodically on the oysters and associated fauna at these various "stations." Each station consists of three pairs of slabs placed at upper, middle, and lower levels in the oyster zone. Of each pair one slab is to be left in its natural state as a control, the other being subject to various methods of cultivation, such as cleaning (from algæ), removal of pests, thinning out of excess oysters, &c. From periodic observations of these slabs it is hoped to obtain data on the incidence of spatting and on the growth, condition, and pests of the oyster and also on those factors which influence their growth—observations which it is impossible to make on the natural reefs in the quantitative way which is necessary.

Systematic notes are also being made on the habits of the borer (*Thais scobina*) with a view to finding the most effective manner of dealing with this pest.

Daily records of water temperatures and other meteorological conditions are being kept by the Inspectors in charge of launches in the Hauraki Gulf, the Coromandel district, the Bay of Islands, and Kaipara Harbour.

As a result of considerable research upon oysters in Europe and America, it is already known that these molluscs can only ripen their sexual products and spawn when the temperature of the water has reached a certain level. The required temperature varies for different species of oysters. One of our immediate aims is to ascertain what this is for the Auckland rock-oysters. So far, we only know

in a general way that our oyster reproduction shows considerable variation: it takes place more abundantly in some years than in others; the summer season of 1927–28, for example, which was very warm and genial, was by far the best oyster-spawning season which has occurred between 1925 and 1930; the fixation of young oysters is also known to take place on a more generous scale on some beds than on others. Generally speaking, the oyster beds of shallow bays in which the water in summer warms up quickly, give better results than beds which are adjacent to deeper water. It is desirable, however, to have these phenomena recorded in terms of scientific precision. Otherwise oyster-cultivation and other operations cannot be organized so as to ensure the most profitable return for the output of labour and expenditure.

There appear to be some oyster areas where successful spawning is the exception rather than the rule, and where the stock is maintained by the generation of one satisfactory brood in several years. When such beds are in their virgin condition this state of affairs is not easily recognized, and in fact has not been recognized. A concrete instance is the case of the oysters in the Coromandel district. These were once exceedingly well-stocked beds. In the past they were greatly overpicked and seriously depleted. To remedy this, considerable attention was paid to rock-wall cultivation when this kind of work was first taken in hand by the Department. It has, however, produced exceedingly little result, for the reason that the numerous artificial rock-walls were built in places where very little successful spatting has subsequently taken place. Similar rock-walls in the Bay of Islands, on the other hand, have produced oysters abundantly. The difference has undoubtedly been a matter of temperature, though other factors also may have operated to some extent; but the significance of this was not understood at the time when the work was undertaken, and the reason was that no scientific observations had been made. A more extreme case of wasted effort owing to the ignorance of this factor was when, in 1915, northern rock-oysters were transplanted to the Marlborough Sounds where they failed to reproduce, and the experiment proved a failure. In the past year, as mentioned above, we have found that oyster-reproduction has been generally successful in the Kaipara Harbour, but has practically failed in the Bay of Islands and in the Hauraki Gulf.

In my report for last year some mention was made of the science of hydrography in connection with the visit of the Danish research steamer. I expressed the opinion that until a series of hydrographical investigations had been made for the elucidation of the physical and chemical character of the seas around New Zealand we should never obtain a complete understanding of the migrations and distribution of many of our important food fishes. The provision for such work still remains a hope for the future. In the meantime, an attempt has been made to gather together such records as exist as to temperature observations in New Zealand seas. By the courtesy of the Naval Secretary records of temperatures taken between 1921 and 1928 on H.M. ships "Chatham," "Diomede," and "Dunedin" have been collected and tabulated for further study and reference. Arrangements have also been made for the regular recording of sea-temperature by the New Zealand Government ship "Tutanekai" in the course of her periodical cruises to the lighthouses. In time we shall thus have more precise knowledge of this aspect of sea conditions, and we may be able to correlate the data with observed conditions with regard to the fisheries. It should also be mentioned that Captain Stewart, on his voyage with the whaling-fleets to the Antarctic in the 1929–30 summer, took daily observations of sea-water temperatures, &c. These records will serve to augment the records which have been made on various Antarctic expeditions. In this connection it may be observed that annual variations in the drift of cold water from the Antarctic must exert a profound influence upon the spawning and migration of fishes off the New Zealand coasts as well as upon the climatic conditions in the Dominion. It is at least possible that an abnormal drift of cold water from the Antarctic to these latitudes was responsible for the inclemency of the weather of last summer and also for the failure of oyster propagation and the delaying of the spawning of certain marine fishes off the east coast of New Zealand.

Mussel Observations.

Mussel-beds in Whangarei Harbour and in Tauranga Harbour have been inspected and roughly surveyed by the Marine Biologist in conection with the framing of regulations regarding their commercial exploitation. The survey of the mussel-beds in the Hauraki Gulf, which are of great extent and of considerable commercial value, is a task which still remains to be undertaken. A preliminary study of the growth-rate of these mussels has been made by Captain Daniel, Inspector of Fisheries, Auckland, by means of a marking experiment. The experimental cage was interfered with and came to grief, prematurely ending the experiment, but, so far as it went, it showed that the mussels increased in length by approximately 1 in. in a year.

Snapper Investigations.

The observations begun in 1925 have been continued by Captain Daniel as opportunity allowed. Catches have been measured and stomach contents have been examined with a view to showing the feeding habits of this species throughout the year.

Salmon.

Collections of scales from both quinnat and Atlantic salmon, for age-determination purposes, have been made by the co-operation of various outside helpers, but nothing in the nature of a comprehensive study of this material can be made until additions can be made to our staff and facilities for research.

Whitebait.

The results of general inquiries into the condition of the whitebait fisheries were summarized in last year's annual report (pp. 14–18). Arising out of these considerations came the recognition of the fact that until the gaps in our knowledge of the life-history of this species could be filled up we were not in a position to tackle the framing of regulations for its conservation with due insight into the fundamental facts of the situation. In particular, it was recognized that light should be thrown on the spawning of the species. Besides the well-known fact that whitebait, which are inanga (*Galaxias attenuatus*) at a juvenile stage, enter the mouths of rivers from the sea, there existed convincing evidence that the adults when about to spawn migrated in shoals from fresh water down to tidal water. The Maoris believed that the inanga spawned in the sea, and this view has been accepted by European and New Zealand writers on the subject, although there is also on record an account of the observation of what appeared to be the act of spawning of a shoal of "minnows" close to the bank of the Hokitika Estuary about half a mile from the open sea.*

The exact location and identification of the naturally deposited spawn and the distribution of the larval (pre-whitebait) stages were unknown until the Department's investigations were made. Some preliminary light was thrown on the subject when, in May, 1929, ripe inanga of both sexes were obtained from the Whakapuni Drain near Foxton and the ova artificially fertilized by Captain L. Hayes. Different lots of these ova were kept during the incubation stage in water of four different grades of salinity—(1) Sea-water from Wellington Harbour, (2) a mixture of two parts sea-water and one part fresh water, (3) a mixture of one part sea-water and two parts fresh water, (4) fresh Wellington tap water (derived from the Wainuiomata).

The somewhat surprising outcome of this was that healthy larval fishes hatched out from each lot, indicating that both eggs (embryos) and larvæ were tolerant to either fresh, brackish, or salt water, which is in itself a very exceptional phenomenon. It suggested that the natural incubation of this species took place under very variable conditions with regard to the salinity of the surrounding water, such as would be found for instance near the mouth of a tidal river. It was also found that the eggs preserved their vitality when kept packed in damp moss for several days. By this experiment also the character of the egg and of the newly hatched larva was determined—a necessary starting-point for the identification of the same when found naturally occurring. The number of eggs produced by a single female inanga has been found to vary from 1,500 in the smallest ($2\frac{5}{8}$ in.) fish to over 13,000 in a very large ($5\frac{1}{4}$ in.) specimen.

A further step now to be recorded is the actual observation of the act of spawning, the location of the spawn, the incubation period, the emergence of the newly hatched young fish, and their natural distribution. These observations were carried out by Captain Hayes on the Manawatu River between about three and a half and eight miles from its mouth, on a visit made about the middle of March, 1930, and on subsequent visits. The main facts which he brought to light are as follows: The ripe fish migrate to the tidal water in shoals, arriving at the time of spring tides. These migrations were observed to take place in the Manawatu River this year in March (once) April (twice) and May (twice). There was evidence to support the supposition that a spawning had also taken place in February. For spawning the shoal approached the very margin of the river at the time of high water. The minute eggs are deposited among rushes, grass, or other vegetation which affords concealment for the spawning fishes and cover for the eggs which adhere in masses on the ground about the bases of the stems of rushes or grasses. Spawning did not take place till the highest of the spring tides had passed. The ova were thus left "high and dry" when the tide receded, and, since they were deposited as near the water's edge as the fish could get and the tides which followed were of diminishing height, there could be no further contact with the water until the next spring tides occurred. The spawn is thus assured complete protection from any aquatic enemy for practically the whole of the incubation period. When the eggs are once more submerged on the next spring tide reaching them, hatching takes place and the larvæ are carried down by the ebb tide. At the time when the eggs were hatching out considerable quantities of the larvæ were taken by tow-netting in the estuary just above the bar. It has been demonstrated that if the spring tides succeeding the one on which spawning took place are not so high and therefore do not reach the zone where the spawn is deposited, the embryos remain unharmed while hatching is deferred. The period between spawning and hatching may thus be about fourteen days, or it may be extended to as much as forty-eight days. This provision by which the parent fish deposit their spawn at places which are only covered with water at the highest tides practically ensured immunity from enemies under the original natural conditions which held previous to the colonization of New Zealand. Under present-day conditions, however, adverse factors come into play which were not contemplated, so to speak, in the original natural state of affairs. In the locality investigated it was found that horses, cattle, and even human beings, by trampling over the ground on which the whitebait eggs were deposited in hundreds of thousands, wrought a considerable amount of destruction. A full account of these observations and other points connected with the natural history of the whitebait will appear in a later report.

It appears that there is a regular "whitebait" fishery carried on from the Northcote pier in Auckland Harbour during the summer months. I was first informed of this fishery by Mr. A. W. Martin, of Northcote, who stated that the run commenced about November and finished about March. He had been catching them at Northcote for the past fifteen years. These facts were so difficult to square with what we knew about the season of the ascent of the *Galaxias attenuatus* young from the sea that it was suspected that an entirely different species of fish was here involved. Samples of the Waitemata

* Phillipps, W. J.: "The New Zealand Minnow." N.Z. Jour. Sci. & Tech., Vol. 7, No. 2, p. 117.

" whitebait," taken on the 7th February, 12th February, 11th March, and 15th April respectively, were accordingly obtained from Northcote. On examination they proved to be not Galaxiidæ at all, but young fish belonging to the sub-order Clupeoidei to which the European herring, pilchard, and anchovy belong. The first sample consisted entirely of young anchovies (*Engraulis australis*), but the sample obtained in April was found to consist of a mixture of young anchovies and young pilchards (*Sardinia neopilcharda*), the former predominating in the proportion of approximately 73 per cent. These fishes ranged in size from about 1½ in. to about 2 in. Viewed casually in the mass they certainly have a close resemblance to the whitebait proper, but when the individual fish are examined the difference between the Clupeoid and the Galaxiid form is immediately discernible. It is hoped to make further study of these young fishes of the Waitemata Harbour in order to throw light on the Clupeoids of the Hauraki Gulf which up to the present have not been commercially exploited.

Shags and the Fisheries.

Investigations in Kaipara Harbour.

From time to time complaints as to the depredations of shags have been received from various bodies representing both fresh-water and marine fishery interests. Most of the acclimatization societies have followed the policy of paying premiums for the killing of these birds—a policy which has been restricted by financial considerations only.

Our files show that subsequent to the year 1902 periodical raids were made on the shag " rookeries " in the Waitaki River district in order to keep down the numbers of these birds for the benefit of the young salmon. There is also on record a statement from the then Under-Secretary for the Department of Internal Affairs to the effect that " when, in 1907, as the result of the investigations of the Agriculture Department, it was found that the shag was the host of the parasite found in trout in the Thermal Regions, it was decided to grant a subsidy of 1s.—subsequently (in 1911) increased to 2s. 6d. —per head for all shags caught in the Rotorua Acclimatization District." In 1922, " in view of the great improvement in the condition of the trout there and the further necessity of cutting down expenditure, it was decided that the payment of subsidies should cease and in lieu thereof that during the nesting season a Departmental officer should visit the principal shaggeries and kill off as many of the young as possible at an estimated cost of £25." The subsidy was again brought in during 1924 and increased to 2s. 6d. per head in 1926.

The great majority of the complaints from fishermen have been with respect to the depredations of the black shag (*Phalacrocorax carbo*) on trout-streams. But as far back as 1922 representations were made by the Kaipara fishermen with a view to obtaining a Government grant—£100 was the sum named—for the purpose of destroying shags which were regarded as a serious menace to the flounder and mullet fisheries. The species here in question is the large pied shag (*Hypoleucus varius*) which fishermen call the big black-and-white shag. The Marine Department's view, based on the opinion of the then Chief Inspector of Fisheries, was that the expenditure of £100 would not be of any practical use. In his view, the only way to reduce their numbers was by simultaneous killing along both east and west coasts. He considered that this would require to be continued over a period of several years to be of any practical use, a course which was too expensive to be undertaken.

The above is an indication of the point of view held by various bodies responsible for the welfare of the fisheries. Summed up, it amounts to this: that the black shag and the large pied shag are objects against which war should be waged for the benefit of the fisheries provided that it does not cost too much.

There are, however, other and contrary views on the subject. The latest and perhaps the most weighty statement of the case for the saving of the shag was that of the Committee appointed by the Auckland Philosophical Institute for the ecological survey of Waitemata Harbour when, in 1926, moved by the propaganda of the Auckland Acclimatization Society directed towards inducing the Government to take steps for assisting in the destruction of sea-shags, they sent a memorandum to the Standing Committee of the New Zealand Institute with a request that their views might be passed on to the Government Departments concerned. Their contention, apparently accepted by the Standing Committee, was that the bulk of evidence was in favour of shags of every species. I am afraid I cannot agree with that conclusion. In the first place, the evidence does not bulk very large. Most of the published references to the subject have been written by amateur ornithologists, bird-lovers, who show themselves just as apt to throw a strong light on the more innocuous habits of the shags as the fishing fraternity do on their fish-eating habits. It would appear that every observation in favour of the birds has been published while the experience of fishermen has never been systematically recorded, but only used as a basis for general statements. The Auckland Ecological Survey Committee memorandum states the case for the shag in general terms, quoting references to evidence which had been gathered. Its chief usefulness lies in the attention which it draws to the fact that there are several species of shag which vary in habitat and in their feeding habits and which must not be regarded equally as enemies to fish-life. Special reference was made to the article* by Myers and Atkinson in the New Zealand *Journal of Agriculture* for May, 1924, in which all the published evidence on the subject was considered. Buller, Guthrie-Smith, R. A. Falla, Edgar Stead, and J. R. Annabell are the bird authorities whose observations are quoted.

* " The Relation of Birds to Agriculture in New Zealand."

Myers and Atkinson, after quoting the published evidence of the above-mentioned authors, conclude that section of their article dealing with shags as follows :—

" To sum up the shag position, of the eight species of shags occurring on the mainland, two are too rare to need economic consideration ; four are almost exclusively coastal shags, feeding by no means entirely on fish, and even then doing no appreciable damage to fish interests ; and, finally, only two fish to any extent in fresh water, and of these only one has ever been proved to catch trout. Regarding this last one, the black shag, it is still by no means certain that it is not more of a friend of the angler than a foe. Its persecution should not be subsidized, but whether it should be positively protected, as should be indubitably all the other species, is another matter, to be decided by impartial scientific investigation."

These writers consider that the fresh-water-fishing black shag is the only species to be suspected of doing damage to fishing interests. They admit that there is a possibility of a case being made out against it, but urge that a decision should only be made after impartial scientific investigations have been carried out. I thoroughly agree with them as to the necessity of deciding by impartial scientific investigation ; but, while suspending final judgment until the evidence of scientific investigation is forthcoming, I am of the opinion that the statements which have been made from time to time by men who gave been close observers of the operations of shags on trout streams make a very strong case against the black shag. On numerous occasions mobs of these birds have been seen making concerted operations on pools in trout streams with eminently successful results to themselves and disaster to the trout. Shags which have been shot have been found to have trout, sometimes several, and much more rarely eels, in their stomachs. Unfortunately, acclimatization societies and other authorities, which have in the aggregate spent thousands of pounds on premiums for the destruction of shags, have never kept any systematic record of their stomach contents. If they had we should be in a very much better position to consider our final verdict. The best friends of the birds admit that they eat trout and considerable quantities of trout. But, they say, the shag eats a lot of eels also : and eels are devourers of trout and trout-ova. The question thus arises, What is the equivalent of each eel killed by a shag in terms of trout saved which would otherwise have been eaten by the eel ? Then we require to balance the sum total of eels helpfully killed against the number of trout devoured by shags. Obviously we need data systematically obtained and scientifically considered. It is by no means definitely proved that eels are altogether inimical to the well-being of trout, for big trout feed on small eels just as big eels feed on small trout ; and Mr. Edgar Stead's statement quoted by Myers and Atkinson that " a 2 lb. eel could easily eat all the spawn of a 5 lb. trout, and is just the right fish to find it," is surmise and not evidence. The facts remain to be ascertained and to be considered in their proper perspective by the unbiased scientific investigator. If a stream is overstocked with young trout a certain amount of thinning-out is doubtless beneficial, and this is one of the grounds upon which Mr. Edgar Stead's case for the shag is based. Certain of the Canterbury streams, on which his observations were made, possibly fall into this category ; but the question as to whether these streams are overstocked with yearling trout or not is also one which requires to be determined by scientific investigation. There are present indications that very many of the trout streams in the Dominion are understocked ; and the trout abstracted from such streams by shags can ill be spared. However, I am at one with the ornithologists in urging that the question should be decided by scientific investigation. The responsibility devolves upon fishery authorities not merely to be convinced of the pestilential character of the black shag, but to prove it, if only to justify the expenses incurred by its destruction. They will certainly not be satisfied by the evidence brought forward by its friends in favour of the black shag which, since only the most occasional observations are on record, is extremely exiguous so far as our own conditions are concerned. It is also supported with too many references to the opinions of ornithologists of other countries, where conditions are quite different, to be accepted as cogent by the unbiased scientific mind.

I now come to the species which is the main subject of this section of my report—namely, the large pied shag, which, although its protection has been advocated by the ornithologists referred to above, has for long been regarded as a serious enemy by several sections of the sea-fishing community.

Last winter representations were again made to the Marine Department by the Kaipara Fishermen's Association for financial assistance to enable them to deal with the shag colonies of the Kaipara Harbour which they maintain have had a great deal to do with the deterioration of the flounder fisheries in those waters. As already mentioned, the former attitude of the Department had been to accept the fishermen's contention that the shags were inimical, but to regard any adequate project for their destruction as impracticable on the score of expense. On this occasion the view was taken that here was an opportunity to co-operate with the fishermen not merely to destroy a number of shags, but to make some much-needed observations as to their distribution and feeding-habits as a contribution to the scientific investigations which had been demanded by the shag advocates, and which had never previously been made.

Arrangements were accordingly made with the Helensville fishermen, and on the 14th September, 1929, shooting parties were organized to visit the shag haunts in some of the many tidal estuaries and creeks of Kaipara Harbour. In order that as many observations as possible might be made, I was accompanied by the Marine Biologist, Mr. Young, and Captain L. Hayes, and each of us went out with a different launch party. It is hoped to publish the detailed report when further data on the subject have been obtained. The following is a summary of our operations on this occasion.

Seven fishermen's launches were taken out but, in the case of two, shag-shooting was made subsidiary to flounder-fishing operations.

The following table shows the main facts with regard to the launches and guns employed, the localities visited, and the birds and eggs destroyed :—

—	Number of Guns.	Places visited.	Number of Shags		Number of Young destroyed.	Number of Eggs destroyed.
			Killed.	Brought back.		
Launch No. 1 ..	3	Hargreaves' Creek, Simpson's Creek, and two other unnamed creeks	About 120	38	About 50	52
Launch No. 2 ..	2	Bishops Creek	42	42	12	29
Launch No. 3 ..	2	Old Man's Nose, Boon Creek, Tauhoa Creek, Stoney Creek	3	3	0	0
Launch No. 4 ..	2	Swan Island	50	9	8	0
Launch No. 5 ..	2	Rauranga Creek, Makarau Point	39	0	0	0
Launch No. 6 ..	1	Gregory's Creek	10	6	0	0
Launch No. 7 ..	1	Glorit Creek, South Creek	29	0	0	0
Totals ..	..	.. ..	About 293	98	About 70	81

When possible shags were shot on their fishing-grounds, but only a very small number were thus accounted for, as they had become exceedingly suspicious owing to their having been previously fired upon from fishing-launches. The greatest numbers were shot at the shag "rookeries" visited. Here again the shooters were handicapped by the fact that such rookeries were located at considerable distances from the navigable channels, miles up remote creeks, and could only be approached at high tide. All the nests seen were built in mangrove trees on the muddy banks of the creek. In the case of the one rookery visited by the launch on which I was present, most of the shags were shot at dawn before they had begun their day's fishing. This accounted for the large proportion of empty stomachs recorded, and reduced the value of the biological observations. The fishermen were anxious to kill as many birds as possible, and it was not without difficulty that they were prevailed upon to see our point of view—namely, that the number of birds examined, not the number of birds killed, was the main consideration.

When possible, the examination of a shag's alimentary tract was made and recorded as soon as it was recovered, but bad weather and other working conditions made it necessary to defer the majority of the food observations until the return to Helensville.

The birds so examined consisted of ninety adult large pied shags and fourteen nestlings, eight of which were fledged birds and six unfledged. Four small pied shags, five white-throated shags (the two varieties of *Microcarbo brevirostris*) and one small black shag which is the yearling form of this species, were also obtained. A few large black shags were seen, but they succeeded in keeping well out of range.

The large pied shags and small pied shags were both nesting ; in some cases nests of the two species (identified by the size of the egg) were found in the same tree. The nesting season of the black shag is apparently later than that of the other two species.

The following is a summary of the results of the examination of the stomachs of ninety large pied shags (adult) :—

		Per Cent.
Number with empty stomachs	29	32
Number with fish in stomachs	59	66
Number with crustacea in stomach	3	3
Number with mollusca in stomach	4	4

It is extremely probable, as mentioned above, that a considerable number of the birds shot at the rookery were empty, either because they had regurgitated their fish for the feeding of the young or because they were shot at daybreak before their departure to the fishing-grounds.

With regard to the actual kinds of food ingested, the following summarizes the results of our examinations :—

Large pied shag (adults) : Contents of alimentary tract—Empty, 29 ; containing fish only, 54 ; fish and mollusca, 3 ; fish and shrimps, 1 ; fish, crustacea, and a young bird, 1 ; mollusca alone, 1 ; crustacea (small crabs) only, 1 : total, 90.

With regard to the kinds of fish ingested, there were fish remains (unidentified) in 29 stomachs ; mullet only in 9 ; flounder only in 7 ; mullet and flounder in 3 ; mullet, flounder, and kahawai in 1 ; mullet and other fish (unidentified) in 3 ; flounder and other fish (unidentified) in 1 ; flounder and herring in 1 ; piper in 2 ; perch (*Perca fluviatilis*) in 1 ; sand-eel (*Gonorhynchus*) in 1 ; horse-mackerel (*Caranx*) in 1.

Large pied-shag nestlings : Of eight fledged birds examined, six contained fish or fish remains (flounder being the only identified species) ; one contained eel-grass (*Zostera*) only. This grass was found together with fish in two other stomachs. One was quite empty.

Of six unfledged nestlings examined, all contained fish, flounder being identified in one case and mullet in two. One also contained isopod crustacea (recorded as "sea-lice").

The stomach contents of the ten specimens of *Microcarbo brevirostris* examined may be given in detail as recorded.

Small pied shags : (1) Fish remains ; (2) shrimps ; (3) dragon-fly larvæ and small bones (of bird or young rabbit) ; (4) flounders (densely packed) and shrimps.

White-throated shags: (1) Crab, shrimps, and flounder; (2) three flounders and one bully; (3) three small fresh-water crayfish; (4) two fresh-water carp (*Carassius*); (5) empty.

The stomach of one small black shag (immature form of the above) examined was found to be full of shrimps, of which fifty whole undigested ones, besides fragmentary ones, were counted.

Summarizing results for these ten individuals of the small pied species we have: Five (50 per cent.) had eaten fish, five (50 per cent.) had eaten crustacea, and one (10 per cent.) was empty.

Three out of the ten had evidently resorted to the fresh-water for their hunting, although actually shot on the shores of Kaipara Harbour. It seems probable that the shags of this species may be regarded as a somewhat minor factor among the agencies adverse to the Kaipara fisheries. They are apparently just as partial to shrimps as to flounders, and are in the habit of picking up a living in fresh-water haunts, which in this part of the Dominion are of little or no interest to the trout fisherman. Above all, however, it may be said that, although by no means uncommon, the small pied and white-throated shags are not so numerous in the Kaipara Harbour district that they need be regarded as a serious menace to the fisheries.

The case is different with regard to the large pied shag. This species is abundant and might perhaps be truly considered as the commonest bird inhabitant of the Kaipara Harbour. It eats far more of the commercially important flounders and mullet than of the other fish less esteemed as human food, and its voracity is indicated by the size and quantity of fish taken for a single meal. The following are examples from the records of our operations: Two 4 in. flounders and two 6 in. mullet; one mullet, $12\frac{3}{4}$ in.; two mullet, one 10 in.; one mullet, over 14 in.; flounder, 9 in. long. The argument may be used—I myself put it to the fishermen—that shags have probably always been numerous in the Kaipara, while the shortage of flounders is a comparatively recent state of affairs, and is probably largely due to the operations of the fishing industry. However, granting that this is correct, we must admit that when the flounder population of the Kaipara Harbour was at its maximum the number of young produced was so enormous that a great deal of thinning out by predators such as shags was negligible or even beneficial to the stock. However, the flounder population of the Kaipara fishing-grounds is no longer at its maximum, but has been considerably depleted; therefore, the same vast quantities of young can no longer be produced. It follows then that the continuous depredations of a large shag population must constitute a proportionately larger drain upon the supply of marketable fish. I think that so far as the Kaipara is concerned it is impossible to conclude otherwise than that the flounder fisheries would be to some degree improved if the large pied shag population were considerably reduced. What are the approximate ratios between the total available flounder stock and the proportion which go to feed the shags on the one hand and to feed human beings on the other hand is a question to which an answer cannot be attempted until more investigational work is done. In the meantime our policy should be to get systematic evidence as to the actual abundance and distribution of these birds and as to their feeding habits throughout the year, as well as biological and statistical data about the fisheries. Any shag-killing operations which are undertaken should be organized with these ends in view, and should not be left entirely, if at all, to the guns of casual sportsmen or the fishermen's intermittent guerillas. Those with a due sense of responsibility will require facts in the first place, and slaughter only so far as it is justified by the facts. Those who are concerned as to the possibility of the extermination of this shag may rest assured that there is every indication that the pied shags of the Kaipara will hold their own for a very long time against the sort of intermittent warfare which has hitherto been waged against them. And if organized operations under proper authority are undertaken they would stop short as soon as the numbers of shags had been reduced to reasonable proportions.

With the full concurrence of the Marine Department two relatively rare species of marine shags—namely, the Stewart Island shag (*P. stewarti*) and the bronze shag (*P. chalconotus*) have recently been placed on the list of absolutely protected birds under the Animals Protection and Game Act by Order in Council dated 24th April, 1930.

Fresh-water Research.

Further noteworthy progress is to be recorded under this heading. The investigations upon trout problems made under the auspices of the Wellington and North Canterbury Acclimatization Societies were mentioned in last year's report. These local efforts have stimulated the interest of other societies concerned with the well-being of trout-fishing. At the conference of the New Zealand Acclimatization Societies Association, held in September, 1929, resolutions were passed by which a scheme was formulated for the co-operation of acclimatization societies throughout the Dominion in the work of fresh-water-fishery investigation. The societies represented at the conference undertook to contribute funds in proportion to their revenues and a central research committee was appointed to organize and supervise researches. This committee is as follows: Mr. L. O. H. Tripp, Wellington; Mr. M. H. Godby, North Canterbury; Mr. G. Howes, Otago; Mr. A. E. Hefford, Chief Inspector of Fisheries (Chairman); Professor E. Percival (Director of Research); Mr. D. F. Hobbs (Research Secretary); Mr. E. J. C. Wiffen, Wellington (General Secretary).

It is hoped to secure the active and financial participation of the Government Departments (Marine and Internal Affairs) that are interested in fresh-water fisheries.

Those who have given any consideration to the question recognize that up to the present all the activities of the various bodies which have had to do with fresh-water fisheries in the Dominion have been pursued with a lack of scientific understanding of the conditions prevailing in the rivers and lakes under their control. It may be said in extenuation that this absence of scientific light was until recently fairly universal, and was not confined to New Zealand. In the older countries the conditions were more stable and the balance of nature already established. Nevertheless, organizations for research have been in active operation for some years in the fishery departments of all the civilized countries of the world. Here in New Zealand we have nature's balance thoroughly upset by the introduction of new predatory species in the form of different varieties of salmon and trout, and from

the relative rapidity with which changes have come about it is evident that conditions are still in a state of flux. Some trout streams that were classed excellent twenty years ago are now only fair. Waters that once teemed with native fish like *Galaxias attenuatus*, of which whitebait is the young form, are now almost lacking in this species. The native grayling is on the verge of extermination. These well-known examples might be multiplied, but this is not the place for a discussion of details. It is clear that the activities of a few men who are expert in the art of hatching and catching fish is not going to provide all that is requisite for the well-being of our fresh-water fisheries. There is, it may be said, no lack of amateur advisers on problems connected with these fisheries—advisers whose confidence and assurance are in proportion to their ignorance of fundamentals. Some of these prescribe putting in more fry as the sole requirement for the improvement of fishing, regardless of the question as to whether there exists suitable and sufficient food-supplies for the proper nourishment of these fry and the fish into which they will grow. Others advocate the introduction of trout-food—shrimps from Samoa, snails from England, bullies from a neighbouring stream, unmindful of the problem as to whether these introduced species would be able to increase and multiply in their new environment.

Before a medical practitioner is allowed to treat patients he is obliged to study the structure of the organs of the human body and to obtain an understanding of their normal functioning. So in dealing with our fisheries: we must first understand the conditions as they are, and the fundamental facts which operate in bringing about those conditions. This understanding can only come from organized investigation. We must know the intimate habits and requirements of the fishes themselves at every stage of life, their rate of growth, the relative importance of the factors which make for their extinction, what propagation of young fish is necessary to provide the most satisfactory stock of catchable fish for particular waters. We must get a measure of the destructive effects of their natural enemies so as to be able to wage rational war against them. With regard to other aquatic organisms which provide food for the fishes, knowledge of their life-histories is equally important. It is especially essential in the case of organisms which are intended to be introduced into trout waters for the benefit of the trout's food requirements. Without this knowledge practical efforts at fish-culture are likely to be at least uncertain, and have in many instances proved futile. For instance, some who have given a limited amount of consideration, mainly theoretical, to the subject have advocated stocking streams with May-flies as a means of improving the trout. Professor Percival has shown that certain May-flies can only reproduce successfully in water which flows at a certain speed. Attempts to stock waters with this species without reference to this fact, which is not one that leaps to the eye, would be wasted effort. So would the attempt to acclimatize the fresh-water prawn from Samoa into water of a temperature which would prevent the maturation of its eggs. This latter has actually been attempted, and, whatever it cost, it is certain that neither trout nor anglers derived any benefit from it.

The only circumstance that stands in the way of a well-organized and effective scheme for fresh-water research is the question of expense. And when this aspect is being considered it is necessary to realize the very considerable waste of money which has taken place from time to time because attempts at stocking or acclimatizing have been undertaken in blind ignorance of the character of the organism introduced and of the environment into which it was thrust. And since even such enterprises as the acclimatization of various Salmonidæ were of the nature of a gamble, success may be said to have been due to careful hatchery-work, plus good luck, and failures to have been due to bad luck in spite of good hatchery-work. As a matter of fact, fish-acclimatization, like that of birds and four-footed game, has been a blind gamble, and will continue to be so until scientific enlightenment is sought and attained. It is not a matter for consulting an outside expert: we have to get on to the job of investigating and elucidating the conditions which hold in New Zealand.

Apart from the immediately practical problems connected with trout propagation and food there are further considerations of no small weight in favour of the establishment of an institution for fresh-water research. The native flora and fauna of our rivers and lakes are in many ways as unique and interesting to science as are the flora and fauna of the New Zealand bush; and similarly they have been affected detrimentally by human agency and the march of civilization. It is very desirable that the factors of change should be studied and their trend understood. Even the outstanding cases have received hardly more than momentary and superficial attention. Consider, for instance, the remarkable species *Galaxias attenuatus*, the young stages of which are commercially known as "whitebait." It is only in the last few months that its unique spawning habits have been made known. The facts revealed are of as considerable biological interest as they are of practical value in relation to the conservation of the species in view of its economic importance. Then there is the New Zealand grayling (*Prototroctes oxyrhynchus*). What do we know about it, except that it was formerly very abundant and is now on the verge of extinction? This is another unique native species which is, moreover, an excellent fish both for the angler and for the table. When it is as extinct as the moa—it is rapidly moving in that direction—those who were responsible for the control of New Zealand fisheries will certainly not escape a good deal of scornful criticism. Is it too late to save this species—to find for it a suitable sanctuary? In the first place, scientific study of its natural history and requirements and the cessation of chaotic and blindfold fishery-control afford the only chance.

The problems of maintaining and improving the fresh-water fisheries are many and complicated. They certainly cannot be solved by occasional and semi-amateur investigations. The only effective, and, in the long run, the only economical method is by an organization definitely staffed and equipped for fresh-water research. It is not so much a question whether we can afford it as whether we can afford not to provide it.

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:—

3rd April, 1929: Prohibition of trawling in Wellington Harbour.—Extension of closed area.

3rd April, 1929: Regulations governing trawling and Danish seining in Hauraki Gulf, Kaipara Harbour, Mahurangi Harbour, and Manukau Harbour.

19th August, 1929: Increasing the regulation size limit for blue cod.

13th January, 1930: Regulation prohibiting Danish seining in certain waters of the Bay of Islands.

13th January, 1930: Order in Council declaring that mussels shall be subject to certain provisions of the Fisheries Act, 1908, relating to artificial oyster-beds.

Regulating fishing for trout and other acclimatized fishes in the following Acclimatization Districts: 21st May, 1929, North Canterbury; 5th May, 1929, Waimate; 9th September, 1929, Auckland (amending); 9th September, 1929, Feilding and District; 16th September, 1929, Waimarino (amending); 16th September, 1929, Waitaki; 14th October, 1929, Waitaki (amending); 11th November, 1929, Hawke's Bay; 15th November, 1929, Whangarei; 15th December, 1929, Waiapu; 13th January, 1930, Westland; 26th February, 1930, Hawera; 26th February, 1930, Hobson County; 11th March, 1930, Tauranga; 26th March, 1930, Wellington.

APPENDIX II.

NOMENCLATURE.

List showing Popular and Scientific Names of Fish, Crustacea, and Mollusca mentioned in Report.

Popular Names.	Scientific Names.
Barracouta	*Thyrsites atun* (Euphrasen).
Bass (or bass groper)	*Polyprion americanus* (Bloch and Schn.).
Blue cod	*Parapercis colias* (Forster).
Brill	*Colistium ammotretis guntheri* (Hutton).
Butterfish (= greenbone or kelp-fish)	*Coridodax pullus* (Forster).
Crayfish	*Jasus lalandii* (Milne Edwards).
Dab (commonly included among flounder)	*Rhombosolea plebeia* (Richardson).
Elephant-fish	*Callorhynchus milii* (Bory).
Flounder	*Rhombosolea leporina* Guenther.
Greenbone (= butterfish)	*Coridodax pullus* (Forster).
Groper (= hapuku)	*Polyprion oxygeneios* (Bloch and Schn.).
Gurnard	*Chelidonichthys kumu* (Lesson and Garnot) and *Lepidotrigla brachyoptera* Hutton.
Hake (= southern kingfish)	*Jordanidia solandri* (Cuv. and Val.).
Hapuku (= hapuka or whapuku)	*Polyprion oxygeneios* (Bloch and Schn.).
Herring (= South Island mullet)	*Agonostomus forsteri* (Cuv. and Val.).
"Picton herring" (= pilchard or sardine)	*Sardinia (Clupea) neopilcharda* (Steindachner).
John-dory (or dori)	*Zeus faber* Linnæus.
Kahawai	*Arripis trutta* (Forster).
Kingfish (northern)	*Seriola lalandi* (Cuv. and Val.).
Kingfish (southern)	*Jordanidia solandri* (Cuv. and Val.).
Ling	*Genypterus blacodes* (Bloch. and Schn.).
Moki	*Latridopsis ciliaris* (Forster).
Mullet (northern)	*Mugil ?cephalus* Linnæus.
Mullet (southern) (= herring)	*Agonostomus forsteri* (Cuv. and Val.).
Mussel	*Mytilus canaliculus* Martyn Linne.
Oyster (dredge)	*Ostrea sinuata* Lamark.
Oyster (rock)	*Ostrea glomerata* Gould.
Piper (garfish)	*Hemirhampus intermedius* Cantor.
Red cod	*Physiculus bachus* (Bloch and Schn.).
Rock-cod	*Lotella rhacinus* (Forster).
Sardine	*Sardinia (Clupea) neopilcharda* (Steindachner)
Skate	*Raja nasuta* Mueller and Henle.
Snapper	*Pagrosomus auratus* (Forester).
Sole	*Peltorhampus novae-zeelandiae* Guenther.
Tarakihi	*Dactylopagrus macropterus* (Forster).
Toheroa	*Mesodesma ventricosa* (Gray).
Trevally	*Caranx platessa* (Cuv. and Val.).
Trumpeter	*Latris lineata* (Forster).
Turbot	*Colisteum nudipinnis* (Waite).
Warehou	*Seriolella brama* (Guenther).
Whitebait	*Galaxias attenuatus* (Jenyns).

MARINE FISHERIES INVESTIGATION STATION.

SIR,—

I have the honour to submit the following report of the operations of the Board of the Portobello Marine Fisheries Investigation Station for the year ending 31st March, 1930.

EUROPEAN LOBSTERS.

On the 31st March, 1929, the stock of lobsters consisted of eighteen males and sixteen females. During the year two males and one female died, leaving the present stock at sixteen males and fifteen females. The deaths in two cases were due to injuries received after casting. In the third case a cancerous growth developed in one of the females, which, however, was not detected till after she had cast her shell.

All but three females developed their eggs during the year and these were hatched out during December, all of them being free of their eggs by the end of the year. It is estimated that about 250,000 larvæ were liberated. These, as they hatch out, escape to sea on the ebb tide. The loss of life is no doubt considerable, but our past experience with the Macdonald jars has not been favourable, and the probability of survival for the liberated larvæ is greater in the open sea than in the tanks, where it is extremely difficult to overcome the cannibalism which prevails among all crowded crustacea of all ages. The time of year at which larvæ are set free is favourable, as the average December temperature of the sea outside Otago Heads is 12·58° C. (54·8° F.).

The adult lobsters become lethargic and cease to feed when the temperature falls near or below 5° C., but otherwise they do not appear to suffer from the winter temperatures of the outside ponds.

HYDROGRAPHIC WORK.

The collection of water samples (for salinity) and recording of ocean-temperatures was carried on throughout the year, but the continuity of the work was broken by the launch being out of commission during July and the greater part of August during alterations and fitting of new engine and apparatus.

As long as the United States barque "City of New York" lay at Port Chalmers, Mr. Shropshire, Hydrographer to Admiral Byrd's Antarctic Expedition, went out with the launch regularly. Hitherto all temperatures recorded have been entirely surface records, as the station is not furnished with suitable thermometers for deep-sea work. Mr Shropshire was able with his thermograph (self-recording) to take observations down to 50 fathoms. It is a matter of interest that at that depth the temperature of the north-east current flowing up the coast past Otago Heads was the same as at the surface.

The following shows the temperature (in degrees centigrade) of the surface-water for the three years ending 31st March, 1930. The records were taken at a station three miles east of Taiaroa Heads on an average once a fortnight between 10 a.m. and 1 p.m.: January, 13·61°; February, 14·55°; March, 14·21°; April, 13·27°; May, 10·99°; June, 10·25°; July, 9·68°; August, 9·51°; September, 9·67°; October, 10·71°; November, 11·68°; December, 12·58°. The temperature of the air taken at the same time was as follows: January, 15·73°; February, 15·72°; March, 14·07°; April, 12·05°; May, 8·5°; June, 7·28°; July, 7·58°; August, 6·75°; September, 8·75°; October, 11·02°; November, 12·53°; December, 13·64°. The highest individual water-temperature recorded was 17·6° C. on the 23rd January, 1928, when the air-temperature was only 17·0° C. Again on the 12th January, 1930, the water-temperature was 17·5° C., and the air 16·5° C. In both cases the weather was very fine and the air still. The lowest water-temperature was 8·5° C. on 12th July, 1928, when that of the air was 7° C. The air-temperatures in the above figures are, of course, higher than the average temperature for the coast as recorded by the Meteorological Department, because they are all taken in the warmest part of each day. But it is interesting to note that the temperature of the sea off the east coast of Otago during these three years never fell below 8·5° C. (47·4° F.). In the open tanks at the station the temperature of the water has occasionally fallen to 0° C. (32° F.), and at this temperature such fish as blue cod die, while others become quite lethargic, ceasing to feed. This appears to be the case with all flat fishes. The water in the tank-house is prevented from falling below 5° C. (41° F.), by passing the delivery pipe through a small coke-fired heater. Even at this temperature many species of fish cease to feed and become lethargic.

It is not possible from a close examination of the salinity returns for the past three years to deduce any observations of value. The period is too short. An attempt to plot the figures and to compare them with temperature curves for the same period gives no informative results.

It was recorded in last annual report that Mr. Scofield, light-keeper at Cape Saunders, had made regular observations of temperatures and collections of water samples, the latter being forwarded to the Government Analyst's Department in Dunedin for estimation of salinity. During the year Mr. Scofield was transferred to Puysegur Point, but he expressed his willingness to carry on similar work there, and accordingly he has been supplied with a stock of bottles, and these are forwarded on the regular trips of the "Tutanekai," by which also the collected samples are brought back. If sufficient equally careful and enthusiastic observers could be secured among the lighthouse men round the coast, similar work to that so well carried out by Mr. Scofield could be done at many other points on the coast of New Zealand.

Biological Work.

The occurrence of whale-feed which is a pelagic stage in the life-history of the bottom-living crustacean *Munida gregaria*, is a matter for regular record, as it is for several months of the year the most abundant fish- and bird-food material found in these waters. This last season Mr. Adams reports that whale-feed were absent from the surface of the sea during the early part of the year (*i.e.*, April) till early in November, when small specimens were seen in surface shoals. Yet in May they were found in the stomachs of red cod and of flat fishes taken outside the harbour. These were probably ground forms or specimens about to change from the pelagic to the ground form. In former years he has noted that they occurred in the harbour in immense shoals, but that for the past six years they have only been seen in greatly reduced numbers, and have remained in the harbour for only limited periods. These observations agree with my own, which extend for over thirty years. The life-history of this species wants working out with careful observation. As far back as September, 1898, immense numbers of the adult bottom-living form—a stout thick-set crustacean 3–4 in. long—appeared in immense numbers in the Upper Harbour, creeping over the stones and under the jetties. In the January following both the adult and the free-swimming forms were found in the stomachs of ling which were caught outside Otago Heads. In September, 1908, Mr. Anderton obtained newly hatched larvæ, but, curiously enough, at the same time met with free-swimming forms carrying ova, a condition also recorded by the late Dr. Chilton. In previous years I have notes of vast shoals both inside and outside the harbour from January to May, but especially in the month of February and March. In some seasons not only every fish taken was found to contain them, but the gulls and terns were gorged with them. Anderton's records, to be found in the Bulletin of the Hatchery (pages 104–5) require to be followed up with care.

The launch was out of commission during the months of July and August, and consequently the usual collection and examination of flat fish during the spawning season could not be carried out. But Mr. Adams was in touch with the local fishermen, who informed him that flat fish were far from plentiful during the whole period. By the end of August nearly all flat fish taken were found to have spawned. As spring advanced the supply of fish remained limited. While fishermen at the Nuggets were securing good hauls of trawl fish the area within ten miles of Otago Heads was but poorly supplied.

"In 16 fathoms common soles (*Peltorhamphus novae-zealandiae*) and lemon soles (*Pelotretis flavilatus*) were mostly taken in small numbers, but close inshore and near the harbour entrance sand flounders (*Rhombosolea plebeia*) of a small size were practically the only flat fish caught. The bottom on which the trawl worked appeared to be clean of the small crabs, worms, and brittle stars on which the fish principally feed. The past winter was a somewhat severe one." Mr. Adams reports that "early in June the temperature of the supply-water was down to 4° C., and on the 30th it was necessary to start the heater. As is usual a number of blue cod in one of the outside ponds died as a result of the low temperature. A few moki in the same pond were not affected, and throughout the coldest months were taking a small amount of food. Nor were they as sluggish as a number of kelp-fish in the aquarium tanks, where the water was seldom below 6° C.

"The set-net has been put down at regular intervals. The greater part of the fish caught were used as food for the lobsters and the fish in the tanks. A number of fish was sent to Dr. Benham and to the medical school, and several dozen dog-fish were preserved. Dredging was carried on both within and outside the harbour."

Since Mr. Young's appointment to a position in the Fisheries Department, the station has been without the services of a specialist to undertake the biological work. In November of last year the Board appointed Mr. David H. Graham to the position, and that gentleman entered on his duties on 1st January, 1930. Mr. Graham has been employed by the Mosquito Research Committee in Auckland for the past two or three years, and has done excellent work there, and shown himself a keen and observant naturalist. In making this appointment the Board stressed the importance of developing the economic side of the work, and particularly of following out, as far as possible, the life-histories of the more important food fishes which occur on the east coast of Otago—viz., the groper (hapuka), red cod, kelp-fish (or greenbone), and moki. Some research has already been done on the development of the blue cod and flat fishes—viz., brill, sand-flounder, greenback flounder, common sole, and lemon sole. The date and location of their spawning, the size and number of their eggs, &c., were worked out by the late Mr. T. Anderton.

Mr. Graham has already commenced to make a reference collection of the local marine fauna, a very useful piece of work, which will only be limited by the accommodation and resources of the station. He has only been at work for three months, but he is most enthusiastic in regard to it and its possibilities, and is inspiring enthusiasm in others. While making himself acquainted with the marine fauna of this region, he is collecting very extensively, and watching in the observation-tanks a great assortment of marine organisms, and is making the station known to numerous visitors by his discourses and explanations on the life of the sea. Many crustacea are being hatched and their development followed out, and he is examining the egg-cases and spawn of mollusca, especially Nudibranchs, which occur in this neighbourhood. In all this work he is ableto count on the practical assistance of Professors Benham and Malcolm, of Otago University, and of Drs. Hercus and Watt, of the Medical School, all of whom are interested in problems of marine zoology, and have been associated with the biological work of the station for some years past.

Mud oysters (*Ostrea angasii*) are known to occur outside the harbour, and are frequently taken in the dredge. Mr. Graham will undertake a systematic survey of the area as soon as possible in order to discover whether the beds are of sufficient extent to be of economic value.

Material has been collected for outside workers and institutions during the past year, among others being: The Auckland War Memorial Museum; H. Webster, Esq., South Kensington, London (Otoliths of Fishes); R. M. Laing, Esq., Christchurch (algæ); Professor Benham, University of Otago (squids); Professor Malcolm, University of Otago (octopi); Dr. Hercus, Otago Medical School (kelp-fish); Dr. Watt, Otago Medical School (Diatomaceæ and foraminifera); A. W. Powell, Esq., Auckland (mollusca).

GENERAL WORK.

Very considerable work has been done throughout the year both in connection with the launch "Karoro," and with the buildings. Mr. Adams reports,—

"A new 15 h.p. Kelvin engine was installed in the launch in place of the 7 h.p. Standard engine. With the extra power the launch can now tow a much larger trawl at a greater speed, and has also a better turn of speed against adverse winds. A winch for hauling in trawl and dredge wires, and working off the engine, has been placed on the forepart of the deck. The launch is now also equipped with gear for lifting the trawl or dredge, when loaded, into the cock-pit.

"The whole of the malthoid roofing of the hatchery and four skylights were renewed. The old net-shed has been converted into a comfortable two-roomed cottage, and is now Mr. Graham's quarters. A new shed for the nets and other gear is almost completed. New roofing-iron was put on both the paint and engine houses. The launch-moorings have been overhauled, and a new length of $\frac{5}{8}$ in. chain attached to the anchor. New iron rails were put down at the slipway. The carriage was also strengthened, and a new wire rope put on the winch. The iron frames of the aquarium-tanks were cleaned of rust and painted. The glass sides of several of the tanks were cracked and leaked badly (apparently due to settlement of the made ground on which the hatchery buildings were erected). These have now been taken out and the whole renewed."

The whole of this work about the station has been excellently carried out by Mr. Adams, with Mr. Broadley's assistance, and without employing any outside labour.

Mr. Broadley, as Inspector of Fisheries for the Otago District, has visited the outlying fishing ports from Moeraki to the Nuggets twice during the year. He has also paid frequent visits of inspection to the wholesale fish-market in Dunedin.

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

Considerable additions to the library, chiefly in the form of bulletins and scientific papers, have been made during the last year. The Chairman also has placed on loan his presentation copy of the late Professor G. O. Sars' monumental work on the crustacea of Norway in nine volumes.

I have, &c.,

GEO. M. THOMSON,

Chairman of the Board.

The Hon. the Minister of Marine, Wellington.

TABLES.

STATEMENT OF REVENUE AND EXPENDITURE FOR THE YEAR ENDED 31ST MARCH, 1930, IN COMPARISON WITH THE TWO PREVIOUS YEARS.

Revenue.

Item.	1927–28.	1928–29.	1929–30.
	£ s. d.	£ s. d.	£ s. d.
Shipping Branch—			
Light dues	81,247 11 8	80,979 13 11	82,710 19 6
Engagement and discharge of seamen, &c.	2,790 2 6	2,583 2 9	2,614 3 0
Survey of ships	5,144 7 6	5,123 8 6	5,037 12 6
Examination fees, &c.	321 5 0	268 8 0	296 5 0
Miscellaneous receipts	427 5 11	296 6 11	673 15 1
Harbours—			
Port dues, &c.	1,801 18 10	1,998 18 5	1,866 17 2
Foreshore revenue	6,212 2 3	5,582 0 5	4,817 17 9
Inspection of machinery—			
Inspection fees	19,503 0 9	19,912 11 4	20,725 8 8
Examination fees, &c.	497 5 0	402 5 0	369 7 0
Miscellaneous receipts	46 16 0	9 18 0	65 6 1
Fisheries—			
Net profit from sale of oysters	1,003 17 11	1,160 0 11	1,850 3 4
Fishing-boat license fees, &c.	483 16 5	437 7 11	441 18 1
Rental of toheroa areas	300 0 0	300 0 0	300 0 0
Sale of trout-ova, &c.	361 3 8	104 12 7	180 15 6
Government steamers—			
Fares, freights, &c.	1,458 9 2	4,046 7 3	1,733 2 6
Ross Dependency—			
Royalties on whale-oil	7,176 15 0	13,961 17 6	7,871 5 0
Miscellaneous revenue—			
Sale of charts, books, and forms	1,228 19 4	1,121 16 10	1,164 9 10
Sale of "New Zealand Nautical Almanac"	160 12 0	149 15 5	133 6 2
Rents of buildings and reserves	185 19 5	177 10 2	270 18 3
Miscellaneous receipts	40 12 10	41 6 4	15 11 4
Totals, general accounts	130,392 1 2	138,657 8 2	133,139 1 9
Westport Harbour Account	65,909 8 1	64,214 5 6	66,274 17 3
Totals	196,301 9 3	202,871 13 8	199,413 19 0

Expenditure.

Branch.	1927–28.	1928–29.	1929–30.
	£ s. d.	£ s. d.	£ s. d.
Head Office	9,721 15 2	9,397 4 4	9,273 9 10
Harbours	7,790 0 0	4,059 18 4	3,576 9 8
Lighthouses	24,266 9 2	23,919 13 11	26,218 14 5
Mercantile marine	24,792 14 9	25,266 9 2	25,308 8 0
Inspection of machinery	21,842 2 1	21,573 2 7	21,907 3 0
Fisheries	3,389 19 10	3,281 12 10	3,727 1 2
Government steamers	20,733 16 9	21,559 12 3	21,395 19 5
Miscellaneous services	2,161 11 7	2,146 4 0	2,138 9 11
Grants and subsidies	594 0 0	260 0 0	1,350 0 0
Depreciation	9,158 5 10	9,662 2 8	9,748 17 5
Interest on capital	18,119 18 0	17,285 17 5	17,434 15 2
Totals, general accounts	142,570 13 2	138,411 17 6	142,079 8 0
Westport Harbour Account	65,828 1 7	68,871 13 0	64,877 10 5
Totals	208,398 14 9	207,283 10 6	206,956 18 5

N.B.—The figures quoted for 1929–30 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, 1930.

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	2,612	254 2 0	2,627	245 10 0	1,793	154 5 0	1,871	161 9 0	4,405	408 7 0	4,498	406 19 0	8,903	815 6 0
Dunedin	661	62 14 0	756	71 10 0	255	23 13 0	254	23 9 0	916	86 7 0	1,010	94 19 0	1,926	181 6 0
Gisborne	1	0 2 0	1	0 2 0	210	14 12 0	186	0 14 0	211	14 14 0	187	14 2 0	398	28 16 0
Greymouth	47	4 12 0	42	4 2 0	69	5 14 0	72	0 6 0	116	10 6 0	114	10 2 0	230	20 8 0
Hokianga	..	..	..	..	..	..	2	0 4 0	..	..	2	0 4 0	2	0 4 0
Hokitika	..	..	..	..	27	1 14 0	31	1 12 0	27	1 14 0	31	1 12 0	58	3 6 0
Invercargill	39	2 2 0	32	1 8 0	78	5 17 0	84	6 3 0	117	7 19 0	116	7 11 0	233	15 10 0
Kaipara	..	..	..	..	13	0 8 0	6	0 4 0	13	0 8 0	6	0 4 0	19	0 12 0
Lyttelton	485	47 15 0	447	44 14 0	678	52 11 0	688	53 10 0	1,163	100 6 0	1,135	98 4 0	2,298	198 10 0
Napier	14	1 8 0	13	1 6 0	285	23 19 0	272	24 4 0	299	25 7 0	285	25 10 0	584	50 17 0
Nelson	8	0 16 0	27	1 19 0	564	43 5 0	556	42 8 0	572	44 1 0	583	44 7 0	1,155	88 8 0
New Plymouth	6	0 12 0	8	0 16 0	50	2 12 0	25	1 8 0	56	3 4 0	33	2 4 0	89	5 8 0
Oamaru	..	..	..	..	5	0 10 0	3	0 6 0	5	0 10 0	3	0 6 0	8	0 16 0
Onehunga	..	..	..	..	346	28 18 0	356	26 18 0	346	28 18 0	356	26 18 0	702	55 16 0
Patea	..	..	..	..	32	1 5 0	32	1 5 0	32	1 5 0	32	1 5 0	64	2 10 0
Picton	3	0 6 0	3	0 6 0	35	3 2 0	47	3 8 0	38	3 8 0	50	3 14 0	88	7 2 0
P.O., Foxton	..	..	..	..	4	0 8 0	5	0 10 0	4	0 8 0	5	0 10 0	9	0 18 0
Tauranga	..	..	..	..	2	0 4 0	1	0 2 0	2	0 4 0	1	0 2 0	3	0 6 0
Timaru	8	0 16 0	8	0 16 0	54	4 15 0	52	4 11 0	62	5 11 0	60	5 7 0	122	10 18
Wairau	..	..	..	..	73	4 10 0	86	5 7 0	73	4 10 0	86	5 7 0	159	9 17 0
Wanganui	1	0 2 0	1	0 2 0	50	4 5 0	45	3 15 0	51	4 7 0	46	3 17 0	97	8 4 0
Wellington	3,718	339 4 0	3,423	316 19 0	2,142	178 2 0	2,227	188 3 0	5,860	517 6 0	5,650	505 2 0	11,510	1,022 8 0
Westport	105	10 10 0	77	7 14 0	95	9 2 0	94	9 4 0	200	19 12 0	171	16 18 0	371	36 10 0
Totals	7,708	725 1 0	7,465	697 4 0	6,860	563 11 0	6,995	578 0 0	14,568	1,288 12 0	14,460	1,275 4 0	29,028	2,563 16 0

TABLE SHOWING TOTAL COST OF MAINTENANCE (EXCLUDING INTEREST ON CAPITAL AND DEPRECIATION) OF NEW ZEALAND COASTAL LIGHTHOUSES FOR THE YEAR ENDED 31ST MARCH, 1930.

Name of Lighthouse.	Salaries and Wages.	Oil consumed.		Stores and Maintenance.	Totals.
		Gallons.	Value.		
	£ s. d.		£ s. d.	£ s. d.	£ s. d.
Akaroa Head	488 7 3	762	53 1 6	210 10 6	751 19 3
Brothers	848 19 1	803	55 17 10	317 2 4	1,221 19 3
Cape Brett	756 11 9	745	51 17 2	684 5 10	1,492 14 9
Cape Campbell	521 6 8	722	50 4 9	221 18 10	793 10 3
Cape Egmont*	364 4 1	459	31 19 3	113 12 3	509 15 7
Cape Maria	882 2 9	864	60 2 11	401 5 10	1,343 11 6
Cape Palliser	488 8 5	670	46 12 6	127 18 9	662 19 8
Cape Saunders	486 9 0	750	52 4 5	170 10 9	709 4 2
Castlepoint	508 8 4	655	45 11 2	115 0 10	669 0 4
Centre Island	723 5 3	678	46 16 3	211 16 6	981 18 0
Cuvier Island	810 16 2	650	45 5 9	339 14 0	1,195 15 11
Dog Island	514 19 10	727	50 12 8	136 10 3	702 2 9
East Cape	485 2 9	838	58 6 11	289 14 5	833 4 1
Farewell Spit	661 11 7	713	49 12 10	229 7 4	940 11 9
French Pass	215 1 8	153	10 13 1	72 11 11	298 6 8
Godley Head	509 6 8	814	56 12 5	184 13 1	750 12 2
Jack's Point	316 0 0	290	20 4 1	48 6 10	384 10 11
Kaipara Heads	801 17 1	944	65 13 8	254 16 2	1,122 6 11
Moeraki	499 17 2	690	48 0 4	89 0 10	636 18 4
Moko Hinou	722 4 1	769	53 10 10	254 16 11	1,030 11 10
Nugget Point	550 1 11	683	47 11 0	135 7 8	733 0 7
Pencarrow Head	534 15 7	835	58 2 11	184 19 0	777 17 6
Portland Island	758 7 4	738	51 6 10	286 3 6	1,095 17 8
Puysegur Point	815 18 7	749	52 3 0	164 4 7	1,032 6 2
Stephen Island	748 18 9	900	62 12 11	271 18 5	1,083 10 1
Tory Channel	100 0 0	183	22 2 8	19 0 5	141 3 1
Waipapapa Point	494 5 6	640	44 10 7	92 4 1	631 0 2
Fog-signals	..	..	..	336 1 4	336 1 4
Automatic lights	..	..	..	1,545 8 11	1,545 8 11
Totals	15,607 7 3	18,424	1,291 10 3	7,509 2 1	24,407 19 7

* Converted to automatic during the year.

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, 1930.

Name of Seaman.	Balance to Credit of the Estate on 31st March, 1929.	Amount received.	Amount paid.	Balance to Credit of the Estate on 31st March, 1930.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Dohrn, R. C. H.	..	57 12 0	..	57 12 0
Downes, T. V.	..	9 13 9	9 13 9	..
Driscoll, J.	..	17 18 10	17 18 10	..
Holmes, E.	..	11 6 4	11 6 4	..
King, W.	..	24 19 8	..	24 19 8
Lee, J.	..	17 11 1	17 11 1	..
Linddahl, J.	5 2 5	..	5 2 5	..
Morley, J.	1 11 10	..	1 11 10	..
McLeod, W.	..	9 4 1	9 4 1	..
Samuelson, M.	..	10 4 0	10 4 0	..
Tull, V.	..	9 17 0	9 17 0	..
Tyrrel, J.	..	1 10 5	1 10 5	..
Totals	6 14 3	169 17 2	93 19 9	82 11 8

RETURN SHOWING AMOUNTS RECEIVED PRIOR TO 1ST APRIL, 1929, 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, 1930. £ s. d.
Anderson, M., late A.B., s.s. "Kaitangata"	25 5 2
Cliffe, F., late A.B., s.s. "Storm"	5 10 6
Darling, J., late deck hand, s.s. "Aotea"	1 8 8
Evans, W., late cook, m.v. "Opawa"	8 10 4
King, C., late A.B., scow "Herald"	8 5 2
Lancaster, J. A., late A.B., s.s. "Gale"	50 1 11
McMahon, S. G., late seaman, s.s. "Apanui"	13 2 2
Nelson, R., late fireman, s.s. "Ripple"	1 1 7
Peterson, F., late A.B., s.s. "Tiroa"	34 10 1
Small, T., late fireman, s.s. "Arahura"	12 15 6
Welsh, T. B., late second cook, s.s. "Marama"	8 7 0
Williams, E. C., late assistant steward, s.s. "Maheno"	2 18 9
	£171 16 10

SUMMARY OF EXAMINATIONS FOR CERTIFICATES OF COMPETENCY AS MASTER, MATE, OR ENGINEER FOR THE YEAR ENDED 31ST MARCH, 1930.

Class of Certificate.	Auckland.			Wellington.			Lyttelton.			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	13	14	27	9	6	15	2	3	5	..	..	..	..	..	..	24	23	47
Voluntary examination in compass deviation	1	1	2	..	..	..	..	..	..	..	..	..	..	..	..	1	1	2
Voluntary examination in yachtmaster in New Zealand waters	2	..	2	..	..	..	..	..	..	..	..	..	..	..	2	..	..	2
Home-trade masters and mates	8	4	12	5	..	5	..	..	..	..	..	..	..	..	..	13	4	17
Masters of river-steamers	..	3	3	..	1	1	1	1	2	..	..	..	..	..	..	1	5	6
Seagoing engineers (steam)	21	12	33	7	3	10	11	11	22	10	5	15	16	8	24	65	39	104
River-steamer engineers	1	3	4	1	..	1	..	..	..	..	..	..	1	..	1	3	3	6
Marine engine-driver	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	1	..	1
Seagoing engineers (oil)	18	7	25	3	1	4	1	..	1	..	..	..	7	1	8	29	9	38
River engineers (oil)	24	3	27	5	..	5	3	1	4	3	..	3	24	2	26	59	6	65
Totals	88	47	135	30	11	41	18	16	34	13	5	18	49	11	60	198	90	288

Summary of Casualties to Shipping reported to the Marine Department during the Year ended 31st March, 1930.

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 wrecks	1	2,813	..	..	..	..	1	2,813	..	..	..	..	..	..	..	..	..	..	1	2,813	..
Slight damage	9	1,046	..	2	106	..	11	1,152	..	1	4,155	..	..	..	..	1	4,155	..	12	5,307	..
No damage	7	5,436	..	..	..	..	7	5,436	..	..	..	..	..	..	..	..	..	..	7	5,436	..
Total strandings	17	9,295	..	2	106	..	19	9,401	..	1	4,155	..	..	..	..	1	4,155	..	20	13,556	..
Collisions—																					
Total loss	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Slight damage	14	3,732	..	..	..	..	14	3,732	..	1	3,150	..	..	..	..	1	3,150	..	15	6,882	..
No damage	9	6,069	..	..	..	..	9	6,069	..	1	994	..	..	..	..	1	994	..	10	7,063	..
Total collisions	23	9,801	..	..	..	..	23	9,801	..	2	4,144	..	..	..	..	2	4,144	..	25	13,945	..
Fires—																					
Total loss	1	5	..	..	..	..	1	5	..	..	..	..	..	..	..	..	..	..	1	5	..
Slight damage	4	3,607	..	..	..	..	4	3,607	..	..	..	..	..	..	..	..	..	..	4	3,607	..
No damage	1	5,561	..	..	..	..	1	5,561	..	1	5,126	..	..	..	..	1	5,126	..	2	10,687	..
Total fires	6	9,173	..	..	..	..	6	9,173	..	1	5,126	..	..	..	..	1	5,126	..	7	14,299	..
Miscellaneous, including damage by heavy seas to hull and cargo, loss of masts, sails, &c., and breakdown of machinery	18	31,581	..	1	25	..	19	31,606	..	16	63,977	..	..	..	..	16	63,977	..	35	95,583	..
Total number of casualties reported	64	59,850	..	3	131	..	67	59,981	..	20	77,402	..	..	..	..	20	77,402	..	87	137,383	..

Return of Land Boilers and Machinery inspected during the Year ended 31st March, 1930.

Class.	Not exceeding 5 Horse-power.	Exceeding 5 but not exceeding 10 Horse-power.	Exceeding 10 Horse-power.	Total.
Boilers—				
Stationary, portable, and traction	1,060	1,340	2,605	5,005
Digesters, jacketed pans, sterilizers, vulcanizers, and other steam receivers	..	..	..	2,532
Air-receivers	..	..	..	388
Total boilers	..	..	..	7,925
Machinery—				
Electric motors	16,989	3,666	4,306	24,961
Internal-combustion engines ..	10,666	932	1,166	12,764
Water-power engines ..	208	82	175	465
Lifts	..	..	..	2,613
Cranes	..	..	..	273
Hoists	..	..	..	1,188
Total machinery ..	..	..	..	42,264
Grand total	..	..	..	50,189

Return of New Boilers inspected for the Year ended 31st March, 1930.

Class.	Made in Dominion.		Imported.		Total.	
	Number.	Horse-power.	Number.	Horse-power.	Number.	Horse-power.
Stationary, portable, and traction	47	953	40	1,192	87	2,145
Digesters, jacketed pans, sterilizers, vulcanizers, and other steam receivers	86	..	113	..	199	..
Air receivers	109	..	184	..	293	..
Totals	242	953	337	1,192	579	2,145

Return of the Number of Certificates issued to Land Engine-drivers and Electric-tram Drivers during the Year ended 31st March, 1930.

Class.	Number.	Class.	Number.
Competency—		Competency—*continued.*	
First-class engine-driver	17	Locomotive-engine driver	3
Second-class engine-driver	160	Traction-engine driver	25
Steam-winding-engine driver	1	Electric-tram driver	44
Electric-winding-engine driver	1		
Locomotive- and traction-engine driver ..	35	Total	286

Return of Land Engineers', Engine-drivers', and Electric-tram Drivers' Examinations held throughout New Zealand during the Year ended 31st March, 1930, showing the Number of Successful and Unsuccessful Candidates.

Place.	Extra First Class.		First Class.		Second Class.		Steam Winding.		Electric Winding.		Locomotive and Traction.		Locomotive.		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.	P.	F.	
Auckland ..	..	..	5	3	18	6	..	..	..	..	1	2	..	..	..	1	9	1	33	13	46
Blenheim ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	2	..	2
Christchurch	..	..	..	..	5	6	..	..	..	..	1	1	..	..	9	..	9	..	24	7	31
Dunedin ..	..	..	..	..	14	3	..	..	..	..	6	..	..	..	1	1	..	..	21	4	25
Gisborne ..	..	..	1	..	6	1	..	..	..	..	..	..	..	..	..	..	..	..	7	1	8
Greymouth ..	..	..	2	5	11	2	..	..	..	..	3	..	2	..	1	..	..	..	19	7	26
Hamilton ..	..	..	..	3	23	3	1	..	1	..	3	..	..	..	..	..	..	..	28	6	34
Invercargill ..	..	..	1	3	14	5	..	..	..	..	3	2	..	..	2	1	..	..	20	11	31
Napier ..	..	..	2	1	17	1	..	..	..	..	1	..	..	..	..	..	..	..	20	2	22
Nelson ..	..	1	1	..	7	4	..	..	..	..	1	..	..	..	3	..	..	..	12	5	17
New Plymouth	..	1	1	..	13	5	..	..	..	..	1	..	..	..	..	..	2	..	17	6	23
Palmerston N.	..	..	..	1	7	7	..	..	..	..	..	..	..	..	..	..	..	..	7	8	15
Timaru ..	..	..	..	..	1	..	..	..	..	..	..	..	1	..	4	1	..	..	6	1	7
Wanganui ..	..	..	..	..	3	2	..	..	..	..	..	..	..	..	1	1	1	..	5	3	8
Wellington ..	..	..	..	5	4	3	..	..	..	..	..	..	..	..	..	1	15	2	19	11	30
Whangarei ..	..	..	1	2	8	1	..	..	..	..	3	..	..	..	..	..	..	..	12	3	15
Totals ..	..	2	14	23	151	49	1	..	1	..	23	5	3	..	23	6	36	3	252	88	340

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, 1930.

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	..	..	..	..	..	..	..	2	30	14	..	3	..	6	..	..	..	..	..	1	100	28	..	15	100	43
Kaipara	..	..	..	..	..	..	..	..	27	4	..	..	..	1	..	..	..	..	..	..	43	5	3	..	46	5
Whangarei	..	..	..	..	..	..	..	..	8	1	..	..	..	7	..	..	..	..	..	..	14	9	..	..	14	9
Auckland*	..	..	4	..	..	..	19	7	60	40	3	2	45	30	..	..	1	1	..	40	300	100	130	..	430	100
Thames	..	..	..	..	..	..	8	..	20	4	..	..	1	2	..	..	1	1	..	..	73	10	37	4	110	14
Tauranga	..	..	..	..	..	..	4	..	5	2	..	3	..	..	..	..	..	..	..	1	20	7	5	..	25	7
Gisborne	..	..	1	..	..	..	..	..	10	..	4	..	10	3	..	..	..	..	..	..	52	3	5	..	57	3
Napier	..	..	8	2	..	..	..	..	9	6	..	..	59	50	..	..	..	..	..	14	136	36	24	8	160	44
New Plymouth	..	..	..	..	..	..	..	..	10	7	..	1	..	13	..	..	..	..	..	..	21	34	6	..	27	34
Wanganui	..	..	..	..	..	..	..	..	1	18	..	..	..	..	..	..	..	..	..	..	2	23	..	..	2	23
Wellington	..	..	2	..	..	..	..	..	55	..	..	..	7	24	..	..	..	..	6	50	244	24	40	..	284	24
Picton	..	..	..	..	..	..	..	..	31	..	..	..	..	4	..	..	..	..	..	..	68	..	..	..	68	..
Blenheim	..	..	..	..	4	8	..	..	..	..	..	..	..	..	..	..	..	..	..	1	8	17	..	..	8	17
Nelson	..	..	1	1	..	3	..	..	12	6	..	..	2	9	..	3	..	..	..	1	30	14	5	..	35	14
Greymouth	..	..	..	1	..	3	..	1	..	4	..	2	..	8	..	..	..	..	..	..	..	25	..	..	..	25
Hokitika	..	..	..	1	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	101†	..	..	..	101†
Kaikoura	..	..	..	..	..	1	..	..	12	..	..	..	..	9	..	..	..	..	..	9	38	..	1	..	39	..
Akaroa	..	..	..	2	2	2	..	2	10	3	..	..	..	5	..	..	..	..	..	2	25	31	1	2	26	33
Lyttelton	..	..	2	..	10	..	..	2	21	10	..	20	20	50	..	..	..	..	..	6	80	100	90	..	170	100
Timaru	..	..	..	..	22	..	..	5	..	17	..	..	..	1	..	..	..	..	..	..	30	1	3	..	33	1
Oamaru (including Moeraki)	..	..	..	..	..	..	..	..	35	2	..	..	..	..	..	..	..	..	..	8	55	2	5	1	60	3
Dunedin and Otago District	..	3	..	34	..	..	..	..	55	..	..	1	9	19	..	..	..	..	..	8	189	32	14	5	203	37
Bluff	..	..	..	1	..	..	..	..	53	..	1	..	..	..	5	3	..	..	..	..	167	..	30	..	197	..
Stewart Island	..	..	..	..	..	..	..	..	..	37	..	..	..	..	..	..	..	..	..	..	..	92	..	16	..	108
Chatham Islands	..	..	..	..	..	..	..	..	12	..	..	..	..	..	..	..	..	..	..	..	34	..	14	..	48	..
Seven minor ports (combined)	..	..	..	..	1	..	..	1	5	19	..	8	..	74	..	..	..	..	..	5	7	133	..	14	7	147
Totals	..	..	22	7	50	40	..	3	33	21	481	494	8	40	153	316	5	6	2	2	6	146	1,736	827	413	65	2,149	892

* Including Manukau, Mercury Bay, and Coromandel. † Whitebait fishermen.

FISHERIES TABLE II.—SHOWING THE VARIOUSKINDS OF FISH CAUGHT AND APPROXIMATELY THE TOTAL QUANTITIES OF FISH AND SHELL-FISH LANDED AT THE DIFFERENT FISHING-PORTS FOR THE YEAR ENDED 31ST MARCH, 1930.

Name of Port.	Principal Kinds of Fish caught.	Quantity landed.	Total Value (Fish).	Shell Fishery (excluding Toheroa).							Grand Total Value.
				Mussels.	Value.	Oysters.	Value.	Crayfish.	Value.	Total Value (Shell-fish)	
		Cwt.	£	Sacks.	£	Sacks.	£	Cwt.	£	£	£
Russell	Snapper, mullet, flounder, hapuku, garfish, kingfish, crayfish	9,922	4,629	..	..	..	..	25	45	45	4,674
Kaipara	Flounder, snapper, mullet	5,250	11,107	..	..	..	..	..	..	..	11,107
Whangarei	Snapper, hapuku, mullet, flounder	4,400	4,666	..	..	..	..	..	..	..	4,666
Auckland* (including Manukau and Coromandel)	Snapper, tarakihi, flounder, dab, sole, hapuku, gurnard, mullet, trevalli, john-dory, dogfish, kingfish, moki, barracouta, frost-fish, blue-cod, piper, skate, crayfish, oysters, mussels	95,760	79,174	5,706	1,554	6,219	7,152	1,558	3,271	11,977	91,151
Thames	Snapper, flounder, gurnard, mullet, john-dory, trevalli, kahawai, mussels	25,481	29,241	2,706	803	..	..	..	..	803	30,044
Tauranga	Snapper, hapuku, mullet, flounder, trevalli, gurnard, john-dory, blue cod	3,440	4,590	..	..	..	..	..	..	..	4,590
Gisborne	Tarakihi, snapper, hapuku, gurnard, flounder, sole, kahawai	2,717	3,528	..	..	..	..	..	..	..	3,528
Napier	Tarakihi, gurnard, sole, flounder, snapper, hapuku, barracouta, john-dory, moke, trevalli, kingfish, kahawai, whitebait, brill, mullet, warehou	16,908	25,922	625	476	..	..	344	675	1,151	27,073
New Plymouth	Snapper, hapuku, blue cod, tarakihi, gurnard, herrings, kingfish, kahawai	1,462	2,051	..	..	..	..	..	..	..	2,051
Wanganui	Snapper, hapuku, blue cod, flounder	536	669	..	..	..	..	..	..	..	669
Wellington	Groper (hapuku), tarakihi, blue cod, butterfish, trevalli, warehou, moki, ling, snapper, bass (bass-groper), gurnard, flounder, sole, barracouta, crayfish	97,300	139,431	..	..	..	..	..	..	..	139,431
Picton	Hapuku, blue cod, moki, butterfish, flounder, tarakihi, garfish, trumpeter, crayfish	5,640	7,888	..	..	..	..	31	40	40	7,928
Blenheim	Sole, tarakihi, flounder, hapuku, gurnard, red cod, snapper, moki, butterfish, crayfish	2,380	3,660	..	..	..	..	80	50	50	3,710
Nelson	Flat fish, snapper, bream, hapuku, gurnard, blue cod	3,142	3,907	..	..	..	..	9	15	15	3,922
Greymouth	Sole, groper, snapper, flounder, herring, red cod, turbot, ling	541	2,091	..	..	..	..	..	..	..	831
Hokitika†	Whitebait, herring, flounder, kahawai, sole, skate, snapper	1,379	11,850	..	..	..	..	..	..	..	11,850
Kaikoura	Groper, ling, kingfish, hake, tarakihi, blue cod, trumpeter, crayfish	3,775	4,665	..	..	..	..	..	..	..	4,665
Akaroa	Groper, flounder, ling, crayfish, sole, moki, butterfish, barracouta, kingfish	4,200	7,745	..	..	..	..	..	..	..	7,745
Lyttelton	Flounder, sole, tarakihi, groper, elephant-fish, kingfish	11,843	12,429	..	..	..	..	..	..	..	12,429
Timaru	Flounder, sole, groper, red cod, ling, kingfish, elephant-fish, barracouta, brill, gurnard	3,720	7,678	..	..	..	..	..	..	..	7,678
Oamaru and Moeraki	Groper, blue cod, ling, moke, barracouta, red cod	5,609	7,726	..	..	..	..	..	..	..	7,726
Dunedin and Otago Districts	Groper, sole, flounder, kingfish, blue cod, trevalli, ling, red cod, tarakihi, moki, green-bone, mullet	34,320	34,320	..	..	..	..	..	..	..	34,320
Bluff	Blue cod, hapuku, flounder, oysters	4,213	8,961	..	..	39,331	24,582	..	..	24,582	33,543
Stewart Island	Blue cod, hapuka, trumpeter, moki, green-bone	7,666	11,974	..	..	..	..	..	..	..	11,974
Chatham Islands	Blue cod, groper, trumpeter	12,359	12,000	..	..	..	..	..	..	..	12,000
Returns from six minor ports		3,676	7,538	..	..	..	..	..	..	..	7,538
	Totals	367,647	449,440	9,037	2,833	45,550	31,734	2,047	4,096	38,663	488,103

*Including 7,058 cwt., value £6,353, from Mercury Bay. † Whitebait only.

FISHERIES TABLE III.—SHOWING THE NUMBER OF SACKS AND VALUE OF THE OYSTERS OBTAINED IN THE DOMINION DURING THE YEAR ENDED 31ST DECEMBER, 1929.

Locality.	Quantity.	Value (Wholesale).
DREDGE-OYSTERS.	Sacks.	£ s. d.
Foveaux Strait	39,331	24,582 0 0
ROCK-OYSTERS.		
Bay of Islands	2,630	
Kaipara Harbour	818	
Hauraki Gulf*	2,009	
Coromandel	341	7,152 0 0
Great Barrier Island	91	
Whangarei Harbour	309	
Wangaruru	21	
Total	6,219	
Grand total	45,550	31,734 0 0

* Takatu to Gull Point, 433; Kawau Island, 65; Rakino, 162; Motutapu, 221; Waiheke, 470; Ponui, 333; Rotoroa and Pakatoa, 16; South Shore, 42; Rangitoto, 258; Motuihi, 9.

FISHERIES TABLE IV.—SHOWING NUMBER AND SPECIES OF WHALES TAKEN OFF NEW ZEALAND COAST, WITH QUANTITY AND VALUE OF PRODUCTS FOR THE YEAR ENDED 31ST MARCH, 1930.

Whaling-station.	Number of Whales taken.	Species.	Yield of Oil.	Quantity of Bonedust and Fertilizer.	Total Value.
			Tons.	Tons.	£
Whangamumu (Russell)	53	Humpback ..	241	40	4,101
Marlborough Sounds (Picton)	49	,, ..	240	..	4,800
Totals ..	102	..	481	40	8,901

FISHERIES TABLE V.—SHOWING THE TOTAL QUANTITY AND VALUE OF FISH IMPORTED INTO AND EXPORTED FROM NEW ZEALAND DURING THE YEAR ENDED 31ST MARCH, 1930.

Fish imported.

Description of Fish.	Quantity.	Value.
		£
Oysters	Nil	..
Anchovies, salted, in containers of 28 lb. or over	12 cwt.	48
Other fish—		
Frozen or fresh	165 cwt.	832
Smoked, dried, pickled, or salted	1,520 cwt.	5,103
Potted and preserved in tins	4,607,542 lb.	215,238

Fish exported.

Description of Fish.	Exporting Ports.*	Quantity.	Value.
Produce of New Zealand.			£
Oysters, fresh	Auckland	155 doz.	15
	Wellington	3,831 doz.	99
	Invercargill (Bluff)	22,450 doz.	326
	Total	26,436 doz.	440
Frozen blue cod	Wellington	4,897 cwt.	15,538
	Lyttelton	349 cwt.	1,047
	Dunedin	33 cwt.	101
	Invercargill (Bluff)	7,737 cwt.	24,133
	Total	13,016 cwt.	40,819
Frozen snapper	Auckland	1,617 cwt.	2,836
	Wellington	228 cwt.	344
	Total	1,845 cwt.	3,180
Frozen flounders	Auckland	1,466 cwt.	5,794
	Wellington	393 cwt.	1,186
	Lyttelton	142 cwt.	487
	Dunedin	366 cwt.	1,157
	Invercargill (Bluff)	267 cwt.	879
	Total	2,634 cwt.	9,503
Other kinds	Auckland	1,992 cwt.	3,704
	Wellington	1,378 cwt.	3,235
	Lyttelton	696 cwt.	1,418
	Dunedin	305 cwt.	676
	Invercargill (Bluff)	894 cwt.	2,437
	Total	5,265 cwt.	11,470
Total exports of frozen fish from Dominion		22,760 cwt.	64,772
Smoked, dried, pickled, or salted	Total exports	414 cwt.	1,208
Potted and preserved in tins—			
Oysters	Total exports	20,316 lb.	1,701
Other kinds	Total exports	109,172 lb.	14,575
Re-exports.			
Potted and preserved in tins	Total exports	31,261 lb.	1,204

* Goods exported are credited to the port at which they are shipped on board the exporting vessel.

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