

B. T. Webb



NEW ZEALAND MARINE DEPARTMENT

**FISHERIES TECHNICAL REPORT
NO. 41**

**FISHERIES DIVISION
INVESTIGATIONS
PROGRESS REPORT - 1968**

**Edited by
B. T. CUNNINGHAM**

WELLINGTON, NEW ZEALAND

1969

FISHERIES TECHNICAL REPORT

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INTRODUCTION

The Fisheries Division is concerned with the continuing supervision of stocks of fish, in New Zealand fisheries waters which includes the freshwater, brackish and marine environments, with a view to their effective and sustainable utilisation and as necessary, to the regulation of their exploitation to prevent their depletion.

The results of many investigations are reflected in changes to the Fisheries Act 1908, and its associated regulations in special conditions applied to fishing permits. In other cases, modifications to schemes for the benefit of the local fish populations, are the result - such is instanced in the various major hydro-electric schemes under construction in New Zealand at the present time.

To undertake the various investigations required, scientific and technical staffs and other specialists are principally centred at Wellington, but the Fisheries Division also maintains laboratories at Auckland, Turangi, Christchurch, Dunedin and Bluff. The Fisheries Technology Vessel, "W.J. Scott", is presently based in Nelson, where temporary laboratory facilities are established. As required, field work is undertaken at appropriate centres throughout New Zealand, e.g., tuna fishing - based in Gisborne; and quinnat salmon studies - based at the Glenariffe Stream on the Rakaia River.

This Fisheries Technical Report gives details about the various management investigations being carried out by the Division's fisheries scientists, technical officers, statistician and technologists. In each case the officers principally concerned with the study are identified and the staff of the Division has been stated. In many instances the studies are carried out with the cooperation of any local management authority such as in the freshwater sport field, the local Acclimatisation Society. Progress is reported for the calendar year 1968, and it is proposed to issue a similar report on an annual basis.

The experimental approach required for many investigations has justified the preparation of detailed reports which have been submitted to appropriate Journals for publication or have been published within this series of Reports by the Marine Department. Where reports have been published or publication is proposed, the vehicle has been stated.

This report shows the comprehensive range of major projects being undertaken and reports progress on each separate assignment.

A sketch map has been included, with the areas where studies are being carried out identified by a serial number, and this number is noted in the text.

SCIENTIFIC AND TECHNICAL STAFF

The scientific, technical and specialists staff (as at April 1969) are as follows:

Director of Fisheries	- A.C. Kaberry, Wellington
Assistant Director of Fisheries	- B.T. Cunningham, Wellington
Technical Investigating Officer	- J.H. Sorensen, Wellington
Statistician	- C. Bolland*, Wellington
Supervisor of Fisheries Scientists	- D. Eggleston*, Wellington
Senior Fisheries Scientist (Freshwater)	- R.W. Little, Wellington
Fisheries Scientists	- J.P.C. Greenway, Auckland
	- M.G. Beam*, Wellington
	- D.H. Stead, Wellington
	- B.W. Webb, Nelson
	- A.M.R. Burnet, Christchurch
	- M. Flain, Christchurch
	- A. Coakley, Christchurch
	- R.J. Street, Dunedin
Food Technologist	- P. Nixon*, Wellington
Gear Technologist	- L. C. Hu*, Wellington
Fisheries Technology Vessel "W.J. Scott"	- Captain J. Brew*, Nelson
Technical Officers	- L. Curtin, Auckland
	- A.G. York, Wellington
	- C.J. Hardy, Christchurch
Technicians	- R.M. Brown, Auckland
	- E.J. Cudby, Turangi
	- D. Williamson, Wellington
	- P.R. Webb, Wellington
	- C.J. Alves, Wellington
	- E.J.A. Ure*, Wellington

4.

Technicians (contd)

- P.J. Allen*, Wellington
- E.R. Midgely, Christchurch
- D. Lucas, Christchurch
- R.H. Goode, Christchurch
- J.S. Kirkman*, Dunedin
- C.S. Crowther, Bluff

Technical Field Service

North Island

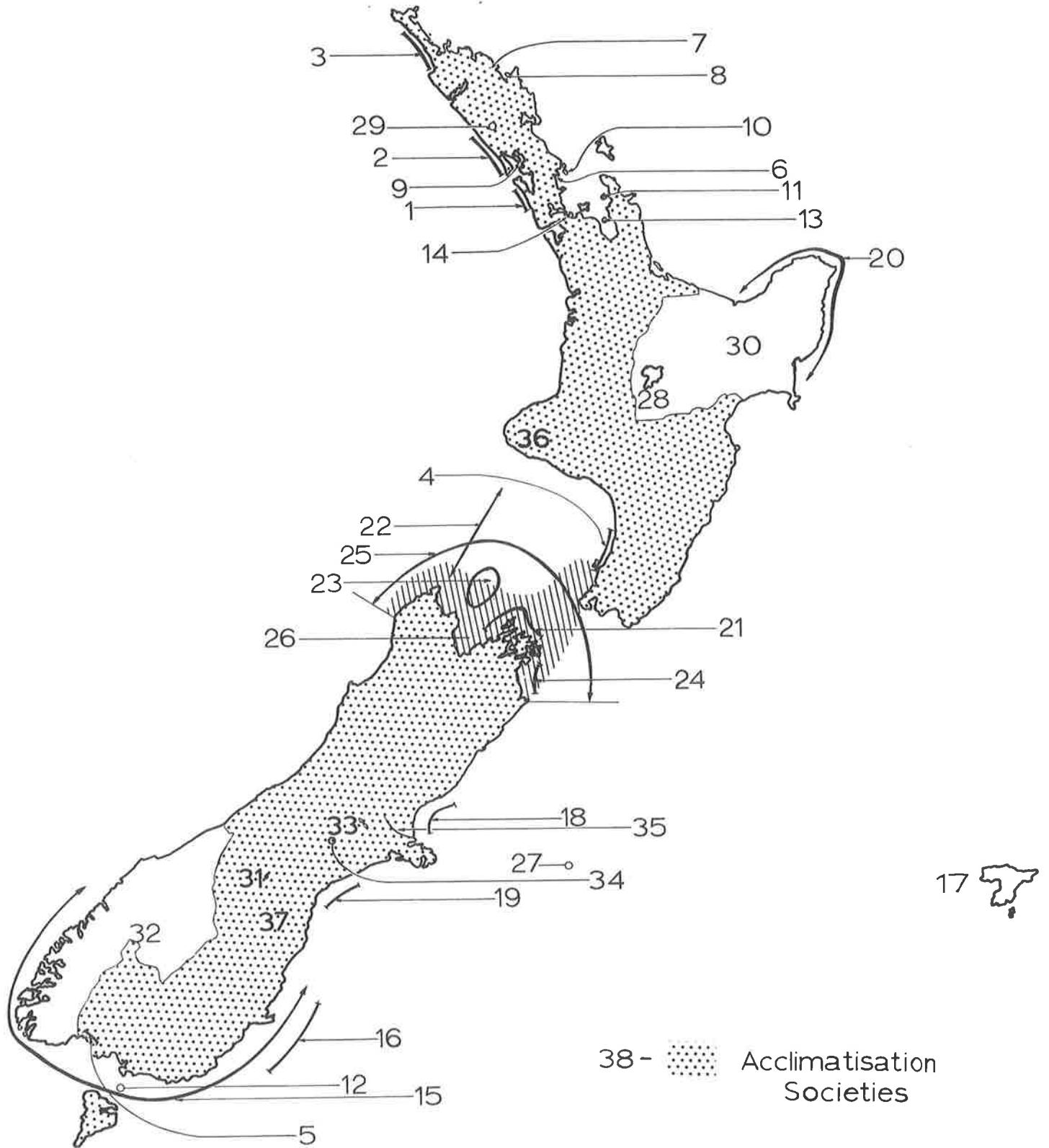
- D. Turner, Wellington

South Island

- J. Galloway, Christchurch
- F.J. Wing, Christchurch
- R. Dougherty, Christchurch
- W.S. Johnson, Christchurch

*Recently appointed.

Figure 1. LOCALITY MAP



INVESTIGATIONS ON MOLLUSCATOHEROA - Northland Beaches - J.P.C. Greenway and R.M. Brown

In order to check stocks, surveys have been carried out both before and after the declared gathering season on Muriwai, (1) and Dargaville (2), and Ninety Mile Beaches (3). During 1968 a decrease in stocks was found post-seasonally on both Muriwai and Dargaville Beaches, but at the same time there was a fairly marked increase on Ninety Mile Beach. Stocks on all three beaches are still at relatively depressed levels when compared with the years 1961 or 1962. Under the physical limitations of these surveys it has not proved possible to form any accurate measure of the direct effect of public take during the gathering seasons. Confidence limits obtained have been very wide and it appears that other (so far not satisfactorily explained) natural causes, have been mainly responsible for the fluctuations witnessed during the past few years.

A paper entitled, "Observations on beach populations of Toheroa, (Amphidesma ventricosum Gray)(Eulamellibranchiata), in the Auckland Province", has been prepared by Mr J.P.C. Greenway and submitted and accepted for publication in the New Zealand Journal of Marine and Freshwater Research. This deals with surveys conducted between 1961 and 1967.

TOHEROA - Wellington Beaches - D. Williamson

A survey of the toheroa stocks on the west coast beaches of the Wellington province (4) between the Waikanae River and the Koitiata Stream, covering some 46 miles was undertaken in June, prior to the opening of the season. From population estimates, the beaches are considered to be well stocked with toheroa of good average size. It appears the density of toheroas is continuing to increase and the length of beach utilised by toheroas is expanding.

A report entitled "Toheroa Survey, Wellington West Coast Beaches 1968" by D. Williamson has been published as Fisheries Technical Report No. 31.

TOHEROA - Southland - R.J. Street and C.S. Crowther

The principal population in the South Island is located in Te Wae Wae Bay (5), Southland. The toheroa beds extend over 7 miles of beach, and along this stretch 35 traverses were 0.2 miles apart. Toheroas are large in size in this area, principal modal peaks in both surveys occurring at 11 cm. A heavy spatfall was present in the December survey. Since the first survey in April 1965, there has been no apparent decline in the total numbers of toheroa present, but it appears that large toheroa over 12.5 cm in length are not now so numerous as previously.

On North Island beaches, there is speculation that toheroas occur below low water, but there is no reason to suppose this in Te Wae Wae Bay. The lower limit of the toheroas usually ends about 60 metres above the low spring tide level. Underwater observations in the sub-littoral zone out to a distance of 250 metres offshore have failed to locate any toheroa.

ROCK OYSTERS - Settlement - J.P.C. Greenway and R.M. Brown

Investigations into rock oysters have been mainly concerned with the monitoring of settlement in the Mahurangi (6) area, (near to Government oyster farming operations), and an experiment to test the relative effectiveness of various artificial surfaces. A paper on the latter entitled "An experiment to test relative amounts of rock oyster, (*Crassostrea glomerata*) settlement on various artificial surfaces using different treatments, spacing, and orientation at Mahurangi, Auckland", by J.P.C. Greenway is being published as Fisheries Technical Report No. 33.

Results showed clearly that a local gas works tar inhibited settlement and that other treatments offered little or no advantage over untreated fibrolite.

Observations on settlement on lengths of plain fibrolite weather stripping are continuing into 1969. When completed a comparison will be made with the 1968 settlement.

A paper entitled "The monitoring of rock oyster, (Crassostrea glomerata) settlement at Mahurangi, Auckland, 1968, 1969" is under active preparation. So far the greatest settlement and survival of rock oysters has been obtained at the lowest levels of support presentation. These have been at approximately mean low water neaps which is a convenient farm working level. Settlement has occurred spasmodically, with peaks, over the period January to June. Only heavy barnacle and some modiolid settlement was obtained during the period July to December.

ROCK OYSTERS - Farming - L. Curtin

The following work was carried out during 1968 on rock oyster farming development.

Bay of Islands

Two demonstration tray farms were erected, one Te Tii (7), the other at Russell (8). A demonstration stick-growing area was also erected at Russell. These areas showed that commercial farming by these methods was possible in the area.

Trial spat-catching racks were erected in the Rawhiti area. A settlement was obtained, but the area discarded in favour of Hauraki Gulf.

As a guide to private farmers, trial growing racks were placed in Keri Keri Inlet, Waikare Inlet and Parekura Bay.

Kaipara

A departmental farm of 500 trays was erected in Deep Creek near Whakapirau (9). This has served as a demonstration unit to prospective private farmers on the Kaipara and has shown that oysters can be commercially grown by this method.

At the base depot at Whakapirau the technique of culling and grading the rough, clumpy, natural oysters that abound in the Kaipara Harbour was demonstrated.

A system of removing overgrown oysters from the extensive departmental rock beds in Port Albert was initiated during the year. These previously unsaleable oysters were removed en masse, culled, and sold to private farmers for maturing on trays. As a result of these operations the rock beds will be restored to their former productivity.

Trial stick growing racks were erected in Tauhoa River, Araparoa River and Port Albert. These demonstrated that the presence of the brackish water mussel, (Modiolus fluviatilis) precludes this type of cultivation in the upper reaches of the Kaipara.

Trial spat-catching racks were erected at Oneriri and Tinopai. Spat settled at Tinopai, but the area proved to be too exposed for commercial operations.

Hauraki Gulf

Spat-catching farms were built at Kawau Island (10), Te Kapa River and Mahurangi River (6). Tarred timber and fibrolite sticks were placed out in all areas. A spat settlement of commercial density was obtained on fibrolite. Spat failed to settle on newly tarred timber. A settlement was obtained on tarred sticks that had weathered for 2 years at Kawau Island.

Because of successful spat catching at Te Kapa and Mahurangi, it was decided to develop these areas as major farms to serve departmental and private farmers' needs. In December the racks were extended to hold 150,000 sticks.

Coromandel

A farm of 500 tray capacity was established and demonstrated that oysters could be grown commercially by this method in the area.

Preliminary work was carried out on the establishment of a stick-growing area farm at Te Kouma Harbour (11).

Other Areas

Trial growing racks were erected in the following harbours as a guide for private industry - Hokianga, Raglan, Ohiwa, Maketu, Tauranga, Whangamata, Whitianga and Whangaroa. Preliminary results are encouraging in all areas.

Marketing

The Department produced a first grade rock oyster from all farms. These were marketed at a price necessary to make the whole farming concept commercially viable.

Export markets were established in Australia, New Caledonia, Tahiti, Singapore and Hong Kong. A quality control inspection of private farmers' exports was carried out during the year.

General

Considerable liaison duties were involved with local bodies regarding desirable sites for private oyster farms. Extensive advisory services to prospective farmers were necessary.

A brochure to assist farmers with farming practice entitled "Cultivated New Zealand Rock Oysters" by L. Curtin, was issued as Fisheries Technical Report No. 25.

DREDGE OYSTERS - Surveys Pre-1960 - J.H. Sorensen

A report entitled "Dredge Oyster Surveys, Foveaux Strait (12) Pre-1960" by J.H. Sorensen has been issued as Fisheries Technical Report No. 28.

This report discusses the discovery and early exploitation of the dredge oyster, (Ostrea lutaria Hutton) in Foveaux Strait. To obtain factual information on the location and extent of the oyster beds surveys were completed in 1906, 1926 and 1945. The results of these surveys were held in Marine Department records and each is outlined briefly, and charts of the beds are reproduced.

Dredge Oysters - 1960-1964 Survey - D.H. Stead

Between 1960-1964 an extensive survey of the location and density of oysters in Foveaux Strait was undertaken, following allegations of depletion of the beds through dredging. The total annual takeable yield was assessed at maximum of 170,000 sacks, oysters over 2 $\frac{1}{8}$ " ring size.

The results of this survey have been the basis of management practice with the production being controlled by way of a season, closed areas, size limit and quota, rather than restricting the number of dredges and special dredging conditions in the boat permit.

The results of this survey are now being prepared for publication, probably within the Fisheries Technical Report Series.

Dredge Oysters - 1968 Survey - R.J. Street and C.S. Crowther

Pre-season and post-season surveys in Foveaux Strait (12) were carried out on the six established stations. In assessing the quantities of oysters present, the two main points considered were the number of sacks per hour's fishing obtained from standard dredging operations, and the density per square metre count from diving observations.

The general trend observed in different survey periods is for both catch rates and bottom densities to fall in the post-season survey, and then make up to some extent again after a five months closed season, which is, of course, to be expected. Catch rates and bottom densities on three of the stations have remained fairly steady over the last three years, but in the other three there has been a downward trend.

A report summarising the results of the annual pre- and post-season surveys is being prepared for possible publication within the Fisheries Technical Report Series.

Mussels - Farming - J.P.C. Greenway and R.M. Brown

Growth and settlement of the large green mussel, (Perna canalicus) has been followed Fisheries technical report no. 41 (1969) throughout the year from the pontoon moored at Te Kouma Harbour (11), Coromandel. Greatest settlement

has been obtained on the drums within six inches of the water surface on floating drums. Peak spatfalls were noted in late September/October 1967, and again in January 1968.

A similar pronounced spatfall was obtained during September/October 1968, and this was also noted in wild stocks occurring on the West Coast beaches.

There were indications that intermittent settlement continued throughout the summer and autumn months of 1968. Some of the first settled spat grew in excess of four inches, total length within a year, indicating a very rapid growth potential. Known and marked first year mussels have now been attached to hanging ropes at 2½ feet intervals from surface to bottom in order to test relative growth at different depths. These are due to be lifted in April 1969, when the oldest will be approximately 18 months and the youngest 12 months old. A paper entitled, "The growth of a suspended settlement of the large green mussel *Perna canaliculus* at Te Kouma Harbour, Coromandel", is under active preparation.

Mussels - Firth of Thames - J.P.C. Greenway

A paper entitled "Surveys on stocks of dredge mussels, (*Perna canaliculus*) Fleming in the Firth of Thames 1961-1967", (13) has been prepared by Mr J.P.C. Greenway, submitted to and accepted for publication in the New Zealand Journal of Marine and Freshwater Research. It describes the recent decline of mussel dredging from Auckland.

Molluscan Survey - Tamaki River - R.M. Brown

Sampling has been carried out in the Tamaki River (14) area in order to establish what would be at stake, if the warmed cooling water, put out by the new Electric Power Generating Station at Otara were to have an adverse effect on local flora and fauna. A report entitled "Molluscan Survey of the Tamaki River, Waitemata Harbour, Auckland, August 1968, at the site of the Otara Gas-Turbine Power Station", has been prepared by

Mr R.M. Brown and submitted for publication as Fisheries Technical Report No. 37.

It does not seem likely that any major change is to be expected, due to the commissioning of the Otara Gas-Turbine Power Station, and the immediate area is of small importance fishery-wise.

INVESTIGATIONS ON CRUSTACEARock Lobster or Crayfish - Life History - J.H. Sorensen

Intensive exploitation, from 1948 of New Zealand's rock lobster (Jasus edwardsii (Hutton)), or marine spiny crayfish stocks has resulted in crayfish becoming the most valuable single species taken by industry. About 90% of crayfish are exported as "tails" with an f.o.b. value of over \$6 million.

With a fishery of this magnitude and value the stocks must be carefully managed to ensure the maximum continuing yield can be taken. Conservation regulations, including size limits, protection of berried female crayfish, and full protection by closed seasons are in force.

A report covering hitherto unpublished data entitled "Distribution, Growth, Embryology and Development" by J.H. Sorensen has been published as Fisheries Technical Report No. 29. This report also documents a technique evolved to determine whether unlawful egg removal has taken place.

Rock Lobster or Crayfish - Biology - R.J. Street

Studies in the growth, moulting and movements in southern waters of the New Zealand (15) rock lobster or spiny crayfish and observations on reproduction and predation in the Otago, Southland and Fiordland areas have been compiled and published under the title "The New Zealand Crayfish" by Mr R.J. Street as Fisheries Technical Report No. 30.

Rock Lobsters or Crayfish - Otago/Southland Crayfishery - R.J. Street

Crayfish catches in Otago (16) increased substantially in 1968. Landings of small crayfish in the early part of the season were particularly high. Even though more boats were operating than formerly, the average catch per day's fishing of small 7 to 10" crayfish from the 'Karitane' area was the highest for nine years. Results from a tagging experiment indicated that the fishing mortality on the Karitane crayfish grounds is at least 45%. Catch measuring again showed that the fishery was very dependent on the growth of the previous season's undersized crayfish.

Boats fishing in Southland (15) waters trail the catch at sea, and consequently, as daily landings are not made, detailed catch/effort data for the whole fleet is not available. Catch measuring was continued in Fiordland, and as in the previous years, undersized crayfish formed a large proportion of the catch.

Growth rate studies continued in Foveaux Strait (12). Tagging experiments have shown that crayfish around the size limit moult once in a year. Additional information on the length increase at moulting, was obtained by holding pre-moult crayfish in a trap on the sea bottom until the moult was completed, and recording the growth taking place. These pre-moult crayfish were not feeding and they were caught by diving. The mean length increase for crayfish measuring around the size limit is .5 cm carapace length (.3 inches tail length) for males and .4 cm carapace length (.25 inches tail length) for females.

Diving observations to determine the location of crayfish populations when they are not potting were continued in both Otago and Southland.

This study has been written up for possible publication within the Fisheries Technical Report Series.

Rock Lobster or Crayfish - Chatham Islands Fishery -
R.J. Street and C.S. Crowther

Further data on the size composition, catch ratio, pot efficiency, and exploitation of a virgin fishery at the Chatham Islands (17) have been continued by making periodic visits to the Chatham Islands, and by way of fishermen's log books.

As a research investigation has been mounted in this fishery by the Fisheries Research Division, this Division's observations are being phased out and urgency placed in compilation and publication of this data.

The results of this study will be published in an appropriate fisheries series.

INVESTIGATIONS ON WETFISHElephant Fish - A. Coakley and E.R. Midgely

Regular monthly sampling of elephant fish, (Callorhynchus millii Bory) from Lyttelton (18) and Timaru (19) was undertaken until the end of October. This completes two full years of data collection for assessments of the basic population structure, maturity and natural fecundity estimates. The initial analyses of these data have been completed, and the information used in re-designing future field work, aimed at elucidating specific management problems.

Initial findings indicate that growth is slower than was first believed, and that there are differences in growth rate in the two areas sampled. Seasonal changes in the population structure show that there is a pronounced migratory pattern in the larger fish. The main commercial fishery is dependant on the sexually mature fish during the summer period when the fish are in shallow waters for spawning.

One aspect of the project, aging of the fish, has presented a problem as the fish have no scales or otoliths. It is possible to age fish up to 4 to 5 years old from length/frequency material as the breeding season is relatively short, allowing some degree of separation between successive year classes. However, in older specimens, there are not enough individual fish to construct meaningful graphs. Aging attempts among these fish, based on a tagging project with anchor tags, began in November following earlier tests with a variety of tag types. The anchor tags are inserted alongside the posterior dorsal fin with the aid of a tagging gun developed by Floy Tag and Manufacturing Inc., U.S.A. This has made tag application much faster than earlier systems thus allowing the fish to be handled less and returned to the water faster.

Gut samples for food items and parasite infection were collected regularly and the initial analysis of this material has been completed by student assistants. Water temperature readings taken during trawling are being prepared for a short paper for submission to the New Zealand Journal of Marine and Freshwater Research.

Tuna - A.G. York

A detailed report of fishing operations for albacore (Thunnus alalunga) and skipjack, (Katsuwonus pelamis) tuna in East Coast and Bay of Plenty waters (20) based in Gisborne covering the 1965 to 1967 seasons, using trolling and gill netting methods has been accepted for publication as Fisheries Technical Report No. 40 entitled "Tuna Investigations 1965 to 1967".

As this study was a joint exercise between the Marine Department and the Fishing Industry Board, preliminary reports have been made available to the Board.

This report also includes hydrological studies relevant to the presence of tuna, and information on catch-rates and the size composition, feeding habits, and maturity of the fish.

Earlier observations made prior to 1965 on coastal hydrology, with emphasis in potential tuna fishing areas, during their inshore migratory phases which also correlates information on temperature, salinity and thermoclines supplied by Dr Humphrey of C.S.I.R.O., Cronulla and S. Kikawa, Japan, are being prepared for possible publication, probably within the Fisheries Technical Report Series.

Shark Fishing - A.G. York

A Tasmanian shark fisherman, Mr V.M. Hardy, was granted special permission to undertake exploratory fishing for sharks during November and December using Australian techniques in the waters of Cook Strait, based on Picton and Nelson (21). Mr York was aboard the vessel concerned, the "Cindy Hardy", to observe and report upon methods which could be adopted by the local fishing industry, should they prove economic.

Using long lines, good catches of school shark, (Galeorhinus australis) with some gummy sharks, (Mustelus antarcticus) were made near Stephens Island at rates comparable to Australian catching rates.

A report covering the method, gear, fishing rates and catches is being prepared for probable publication within the Fisheries Technical Report Series.

Bottom Trawling - B.W. Webb and Captain J. Brew

During July and August, the "W.J. Scott" undertook limited surveys, using a Granton trawl, in the following areas.

- (a) The western approaches to Cook Strait (22) - (for an earlier investigation see Fisheries Technical Report No. 12) - between 60 miles west of New Plymouth to 12 miles north of Cape Farewell.

The catches west of the Taranaki Bight in 70-100 fathoms were very poor; this barrenness of the area has been well known to New Plymouth fishermen for a number of years.

- (b) In the area between the Farewell Spit Lighthouse and Stephens Island, and between 40° 18'S and 40° 35'S (23).

This area was fished by the Rumanian trawler "Constanta" whilst conducting gear and acceptance trials.

There was a small increase in catch rates of commercial species from area (a) to the area (b). This increase was attributed mainly to mackerel (horse and English) and tarakihi, but snapper catch rate decreased.

- (c) A series of eight tows from north of Stephens Island to Cloudy Bay (24).

From west to east, barracouta, mackerel, and shark became the predominant fish species, while red cod, warehou, and john dory increased in abundance.

Elephant fish were caught only in the area north of the Marlborough Sounds and in Cloudy Bay.

In Cloudy Bay red cod, warehou, and barracouta had ripe or ripe running gonads, and the elephant fish had ripe ovaries and large egg-capsule producing organs.

From the distribution of fish species in the Marlborough Sounds/Cloudy Bay area there appeared to be two fish communities in this area.

Purse Seining - B.W. Webb and Captain J. Brew -

Pelagic Fish

Purse seining for pelagic fish from Nelson commenced on 1 October 1968 with the "W.J. Scott" using the net No. 2 with specifications detailed in "Commercial Fishing", May 1967.

The area covered is from Kahurangi Point on the West Coast to Cape Campbell on the East Coast, and extending approximately 20 miles from the shoreline (25).

The aim of the project is as follows:

- (a) to find the fish productivity of the area;
- (b) to assess the potential for establishment of a fishing industry based on purse seining;
- (c) determine any migrations of the fish;
- (d) conduct a brief survey of the plankton;
- (e) undertake a brief investigation into the biology and growth rates of a number of fish species;
- (f) and to make general observations on biological interest.

Since the beginning of the purse seining progress, unfortunately the weather conditions have not been very good and only small quantities of kahawai, horse and English mackerel have been landed.

Aspects of interest to the industry will probably be published within the special series of Marine Department reports describing the activities of the "W.J. Scott".

Pelagic Fish - Aerial Survey - B.T. Cunningham and B.W. Webb

A weekly aerial survey based on Nelson to locate schools of pelagic fish within an area which could be fished by pelagic fishing fleets based on Nelson, Picton or Wellington, was initiated in May. The survey area included Tasman Bay, the West Coast to Kahurangi Point, off Farewell Spit, the west coast of the North Island south of Kapiti Island and Cloudy Bay (26).

The survey was in conjunction with the purse seining programme of the "W.J. Scott" at Nelson.

The position, size and species of fish schools sighted were recorded. Schools of kahawai, English and horse mackerel and pilchards were located. At the conclusion of the survey, about April 1969, the results will be written up for publication possibly within the Fisheries Technical Report Series.

The routine observations were undertaken by Mr R. Little, Inspector of Fisheries, Nelson.

Research Vessel - A. Coakley

A scientist from both the Fisheries Research Division and the Fisheries Division of the Marine Department were invited to participate in an oceanographic and fisheries cruise by the Japanese Government. The trip started and ended at Wellington.

From 17 June to 4 July 1968 was spent aboard the Japanese fisheries research vessel "Kaiyo Maru" observing techniques and advanced scientific equipment available for biological and oceanographic research. Experimental trawling was undertaken in the waters to the east of the South Island, and on the Chathams Rise (27), and three oceanographic transects were carried out, across shallow and deep water, to the east of New Zealand in International Waters.

Fisheries Statistics - C. Bolland

Production statistics of the commercial catch of wetfish crustacea and molluscs are kept. Details are recorded in the Annual Report of the Marine Department to Parliament, and distributed separately as the "Report on Fisheries".

Information for the 1967 calendar year are the latest figures available which show 713,527 cwt of wetfish, valued at \$4,626,000 were landed, and 159,012 cwt of crayfish valued at \$4,320,000 were landed, with the total fishery products having a landed value of \$10,453,000.

Landings of wetfish and crayfish were higher for 1966.

During 1968, further detailed analyses relating to effort, area fished, etc., were required for forecasting purposes by the Fisheries Committee of the National Development Conference. These studies were completed by Mr R.L. Allen, Statistician, (currently on study leave) and reported in the Survey of the Fishing Industry 1968 and the Fisheries Committee Report and the Second Plenary Session of the National Development Conference 1969.

INVESTIGATIONS ON FISH TECHNOLOGYStowage at Sea - P. Nixon

In this project the temperature histories of wetfish will be followed from catching to landing. The method is to place copper-constantan thermocouples in fish as soon as possible after catching and follow temperature changes with a remote potentiometer or other measuring device. Attention is primarily directed towards the effect of chilling and stowing methods, but allowance has to be made for such other factors as season, climate, and area. A major complication is the use of different chilling methods in different areas.

INVESTIGATIONS ON GEAR TECHNOLOGYL. C. Hu

Assistance has been given regarding design of fishing gear and equipment for several projects including gill nets and long lines for tuna fishing, the purse seine for pelagic fishing and the Granton trawl for experimental trawling in Cook Strait. A beach seine net was designed for use in lakes to sample trout populations and their food fishes.

INVESTIGATIONS ON SPORT FISHERIESTongariro Power Scheme - R.W. Little and E.J. Cudby

This project has been changed considerably since it was first planned. Much time has been given to particular problems such as placement of screens to protect the Lake Rotoaira and Taupo fisheries (28), and numerous meetings between power and conservation authorities have taken place.

Mr E. Cudby has continued taking summer and winter bottom fauna samples in streams affected by construction work. Periodic spot checks of suspended sediment concentrations in streams are continuing and summer flows of most of the lower Tongariro tributaries and of one Whakapapa tributary have been measured.

An ecological evaluation of Lake Rotoaira is under way in conjunction with the Fisheries Research Division and under the direction of Dr G.R. Fish and assisted by his staff. Fortnightly temperature, turbidity, lake level and dissolved oxygen data are being recorded at a station set up over the deep part of the lake. In November 1968 a series of bottom fauna samples were collected from one station using diving techniques (five, one square foot samples at one metre intervals from two metres to twelve metres in depth). Preparations are currently in train for the comprehensive survey covering at least one annual cycle before water from other catchments is diverted into the lake in 1971.

Northland Lakes - E.J. Cudby

When Government turned down the proposal to introduce large mouth bass into Northland lakes, the Hobson Acclimatisation Society requested that rainbow trout, (Salmo gairdnerii) be planted in Lake Taharoa (29), one of the Kai-iwi lakes near Dargaville. A major recreational reserve is planned around the Kai-iwi lakes and the acquisition of a suitable sporting fish is very important to the overall success of this scheme.

Two short general surveys utilising diving techniques have been carried out on these lakes in cooperation with the Department of Internal Affairs. The first provided information for the proposed liberation of trout and the second provided data on the fish stocks, six months after liberation, to guide the development of angling regulations for these lakes. The release was made by officers of both the Marine Department and Internal Affairs Department. It appears that trout can be successfully maintained in this lake by artificial liberations.

Wheao Power Scheme - R.W. Little

This is a new scheme designed to bring power to a large timber plant in the Rotorua area. It is proposed that water will be diverted from the Rangitaiki River (30) across part of the Kaingaroa Forest to the Wheao River which eventually rejoins the Rangitaiki River bed some miles downstream. As the potential diversion can accommodate more than the long term mean flow of the Rangitaiki River there will be approximately 10 miles of this latter river dry, except for seepage, for long periods. Additionally, the relatively stable Wheao River may have more than twice its own volume of water added to this good fishing river. As this river flows through pumice country the additional water would make the banks become unstable with adverse effects on this fishery. The fishery implications of this scheme are obviously quite severe. Field investigations have been carried out by officers of the Internal Affairs Department, the Marine Department and the Nature Conservation Council and reports tendered.

Upper Waitaki Power Scheme - R.W. Little

Comalco has accepted use of the Manapouri with a resultant need for additional electric power from the South Island. Government decided to continue with the Upper Waitaki Basin (31) development and to harness all possible power. This major scheme has been finalised and passed by the National Water and Soil Conservation Authority. Fisheries and wildlife aspects must be considered as the scheme progresses by a special consultative committee which the National Water and Soil Conservation Authority states must be set up. This project will take the waters from Lake Pukaki and Tekapo, diverting them across to the outlet of Lake Ohau and thence into the North Arm of Lake Benmore. There will be overflow water flowing down both the old Tekapo and Pukaki Rivers, but the Ohau River, an excellent spawning area, will be severely affected although the lake itself will be almost untouched. While the South Arm of Lake Benmore should have plentiful spawning remaining the North Arm will be severely affected. The only really adequate spawning river remaining untouched would be the Twizel River, but a construction camp is being situated on this river and could prove very harmful. Means of overcoming these difficulties have not yet been looked into in any great detail. Fortunately work done by the Technical Field Service in former years has provided the necessary background information for dealings with power authorities so that no new and extensive field work is required, but special short investigations on particular facets could be required.

Te Anau - Manapouri Power Scheme - R.W. Little

This power project is basically unchanged, but some important changes that affect fisheries have been incorporated. Lake Manapouri (32) itself will be raised to a relatively stable level which should damage the fishery in this lake less than anticipated. The problem of bush removal on the shoreline is still under question and undecided by Government. The bush will be removed, but the methods to be adopted for its ultimate disposal have not yet been finalised.

Unfortunately Lake Te Anau now appears likely to receive more damaging changes to fisheries in the future. This lake, with Lake Manapouri being relatively stable, will necessarily be used as a fluctuating reservoir. Although the amount of fluctuation will not be as great it could be relatively rapid and will definitely reduce productivity of the lake. It is also possible that at a low lake level, access of fish to certain spawning streams may be affected. The other major point of dispute between Conservation and Power Authorities is the placement of the projected control structure in the Upper Waiau River. For economy and maximum power usage a placement approximately half-way between Lakes Manapouri and Te Anau is advocated, but conservation groups would prefer the siting of this dam closer to the outlet of Lake Te Anau, even if this siting is more costly.

Lake Coleridge Investigation - M. Flain and R.H. Goode

Field work at Lake Coleridge (33) was completed on 30 April 1968. Sample analysis is largely completed and the write-up is underway and publication of results would be within the Fisheries Technical Report Series.

A bathymetric chart of the lake has been completed and is to be published in the "Lake Series" of the New Zealand Oceanographic Institute.

Some follow-up work has been undertaken to clarify certain aspects. For example: the fin clipping (adipose) of 24,000 rainbow fingerlings at the North Canterbury Acclimatisation Society hatchery at Silverstream for release into the lake. On the opening weekends of the 1970-71 and 1971-72 seasons, creel censuses will be undertaken. This should establish what proportion of stocked fish are caught and also the effect of a naturally occurring introduction of sea-run quinnat salmon stock into the lake during 1968.

Quinnat Salmon Age Studies - M. Flain and R.H. Goode

The entire run of 3,275 adult quinnat salmon, (Onchorhynchus tschawytcha) through the Glenariffe trap (34) operated by the South Island Technical Field Service, was measured and tagged, and of these 56.8% (1,845 fish) were recovered after spawning and otoliths removed for aging, 1,492 were males and 1,783 females.

Growth rate of the year classes were similar to those of previous years. The runs of quinnat salmon in New Zealand are younger than their North American counter-parts.

To avoid too much fragmentation of the yearly results, and to ensure a greater comparative presentation for the various years, the 1968 material will be combined and published on a four yearly basis. Thus the 1965-66-67-68 data are to be published as one report, possibly in a fisheries journal.

Fast Growing Quinnat Salmon - C.J. Hardy

Arrangements are proceeding to establish a hatchery and experimental station to receive ova of the fast growing strain of quinnat salmon developed by Professor Donaldson of Washington University.

A fast growing strain of fish would have obvious advantages. Mr Flain has recently shown, by aging New Zealand salmon, that their growth rate in the early years equals that of the "Super-Salmon" reported in the literature. There is a large age range in fish caught in the North American area and this would account for the reported size differences.

It is currently proposed to develop an experimental hatchery to compare the growth rates of local and overseas stocks of fish and the effect of specialised foods on their growth rate. It is probable that manipulation of existing fish stocks in this manner would increase the survival of juvenile fish. This hatchery could be used for an experimental studies on imported fast growing strains of quinnat salmon. A site for this hatchery has not yet been selected, but it is hoped that discussions being held with the North Canterbury Acclimatisation Society will prove advantageous to the Department and that Society.

South Branch, Waimakariri River Studies - A.M.R. Burnet

Earlier studies on the inter-relationships of eels, (Anguilla dieffenbachii and A. australis schmidtii) and brown trout, (Salmo trutta) in the South Branch a tributary of the Waimakariri River (35), have been reported in Fisheries Technical Report No. 26.

The controlled cropping of a brown trout population has now been in operation long enough to give a clear result. The "crop" has varied from year to year, and the mean value so far is 92lbs/acre. In cropping, the aim has been to keep the population of older fish down to a third of the unexploited number, and to measure the crop removed.

This control resulted in a marked decrease in the population density. This was followed by a change in the growth rate with fish growing to 28 cm in 3 years, where they took 4 years when the trial started. The mean weight of the 2 year and older fish has increased 2.3 times. This means that the fish population density after cropping is now higher than in the first years of the trial. This study of the inter-relation between growth, and population numbers is proving valuable.

The question has arisen as to whether fin clipping and tagging affects the growth of trout. Records were examined, and the condition factors of tagged trout, fin clipped trout and trout not previously handled were compared. The tagged trout had a slightly lower condition factor.

Of the smaller fish it was possible to compare the growth rates of fin clipped and unmarked fish. In all cases, the fish that had been fin clipped (and caught by electric fishing) had a higher growth rate than those that had not been caught and clipped.

Studies on the invertebrate fauna of the South Branch are being published within the Fisheries Technical Report Series as Report No. 36.

Electric Fishing - A.M.R. Burnet

During the year courses were run to train operators for electric fishing.

A number of difficulties were met with the commercially constructed machines. These took some time to overcome, and it was necessary to test alternative designs. Also the fact that machines are being used in new locations and by less experienced operators has shown up further design weaknesses. Effective use of electric fishing must be dependent upon the electrical knowledge of the operator. The present design described in Fisheries Technical Report No. 19, attempts to minimise this effect, but there are still aspects which could be improved.

Trials during our regular sampling programme have shown that a lower frequency attractive pulse (4/sec) gives a significantly higher catch rate.

Technical Field Service - D. Turner, J. Galloway, J. Wing, R. Dougherty and W.S. JohnsonNorth Island

. The Taranaki project has been completed except for the bottom fauna analysis and write-up. This major job required the use of normal stream survey techniques as well as electric fishing. The service has been utilised for several other related projects - notably pollution causes of the Kaupokanui River and the Kapuni River (36). The latter case is interesting being the first major submission under the Water and Soil Act that this Department has been called upon in an advisory capacity. The Kapuni Stream is proposed as a source of water and as a depository for industrial effluent as well as hot water. An extensive biological survey has already been carried out to learn the status of the stream prior to any ecological change, and further work will be carried out as the project continues.

South Island

In the South Island the past years activities have been devoted almost completely to the quinnat salmon and the trapping of the adult and juvenile runs of the Glenariffe Stream, or tributary of the Rakaia River (34). Unfortunately, the complete trapping of the out-migration of salmon juveniles was beyond the capabilities of the available staff, and sampling again was necessary; nevertheless the other aspects of the enlarged scheme were carried out, e.g., electric fishing and sub-sampling the juvenile population. Because this project must run several more years before the maximum value may be gained, it is absolutely necessary to stream-line the sampling problem so as to release staff for other duties. An electronic counter has been purchased and will be utilised to count the outgoing juvenile salmon next year on a sampling basis, although the adult migration will be trapped in its entirety as long as possible.

Aviemore Spawning Race - C.J. Hardy

Although the race below the Aviemore Power Station (37) was commissioned rather late in the year for brown and rainbow trout from Lake Waitaki to take full advantage of it, a significant run of land-locked sockeye salmon, (Onchorynchus nerka) has used this channel during their spawning period.

Land-locked sockeye salmon had not previously been recorded as being present in Lake Waitaki, the initial and closest to the sea of the hydro-electric impoundments in the Waitaki River.

Angling Diary Scheme - B.T. Cunningham

The response to the 1967/68 Angling Diary Scheme covering all Acclimatisation Districts in New Zealand (38) was not as good as that to the Diary Scheme conducted during the 1962/63 season. During the latest scheme only 984 diaries were received compared with 1,838 for the 1962/3 season. Responses dropped most noticeably and significantly within the Wellington, Auckland, Otago and South Canterbury Acclimatisation Districts.

The coding of the information recorded on these angling diaries has started so that the information can be sent to Treasury at an early date for punching and tabulation to enable analysis and publication of the results to proceed as quickly as possible.

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