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FISHERIES TECHNICAL REPORT

No. 114

THE HAWKE'S BAY TROUT FISHERY

E. GRAYNOTH

WELLINGTON, NEW ZEALAND
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FISHERIES MANAGEMENT DIVISION
MINISTRY OF AGRICULTURE AND
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C O N T E N T S

SUMMARY

This report describes the trout fisheries of Hawke's Bay Acclimatisation District. It is based on angling results collected since 1947 by eight angling diary schemes.

Angling licence sales have increased in recent years and it was estimated that the average Men's Whole Season Licence holder fished for fourteen days to catch seven trout per season. The total district catch of 13,000 trout was caught in 34,000 days angling.

Rainbow trout are the principal species caught and the average length of angler caught fish has changed little over the past twenty years. Brown trout are caught in some waters. Rainbow trout densities and stocks in the rivers were estimated by drift diving and it is suspected that anglers catch a large proportion of the stock.

The major fisheries are described and management advice is given.

INTRODUCTION

The Hawke's Bay Acclimatisation District covers the major angling waters of the east coast of the North Island of New Zealand. The freshwater fisheries are managed by the Hawke's Bay Acclimatisation Society, the Council of which is elected by fishing and game shooting licence holders. The Ministry of Agriculture and Fisheries (formerly Marine Department) carries out fundamental research studies and advises the Society on fisheries management.

This report is based on the annual angling results of 287 anglers from the Hawke's Bay District who recorded a total of 5,708 days angling to catch 5,489 trout in the years 1947-52, 1957-58, 1962-63 and 1967-68. A short field survey was carried out in the summer of 1971 and much valuable information has been obtained from discussions with members of the Society.

A detailed description of the operation of the Marine Department angling diary schemes is given by Allen and Cunningham (1957) and additional information on the accuracy of certain angling statistics used in this report in Graynoth (1973).

THE ANGLERS

The District Boundaries

The Hawke's Bay Acclimatisation District's northern boundary follows the Mohaka River then crosses west over the Kaweka ranges to the upper Rangitikei. There the boundary line turns south along the Ruahines to Woodville then east to just south of Cape Turnagain (Figs. 1, 2 and 3). The approximate area of the district is 10.9 thousand square kilometres (Allen and Cunningham 1957).

The Hawke's Bay District was divided into three geographical regions. The Northern region includes the Ngaruroro and Tutaekuri rivers. The Central region includes the upper Tukituki watershed centred around Waipukurau and the Southern region around Dannevirke covers the upper Manawatu watershed. The Porangahau River on the east coast is not fished and probably contains few trout due to poor spawning conditions (Allen and Cunningham 1957).

The Number of Anglers

The sport of angling is more popular in Hawke's Bay District than in Wellington District. In 1961, 3.2% of the adult male population of Hawke's Bay held Men's Whole Season licences and in 1966 this number increased to 4.0%. Including short term licence holders and those anglers who only fish in Rotorua and Taupo approximately 6% of adult males are freshwater anglers. A comparative estimate for Wellington is 3%.

It is remarkable that Hawke's Bay is the only North Island Acclimatisation District to show a steady increase in licence sales since the early 1950s. Men's Whole Season licence sales are increasing at approximately 8% per annum (Fig. 4), that is faster than the rate of population growth. The reasons for this are difficult to understand, since in many waters it is relatively difficult to catch trout. The Acclimatisation Society's publicity efforts or just the abundance of easily accessible waters may account for this.

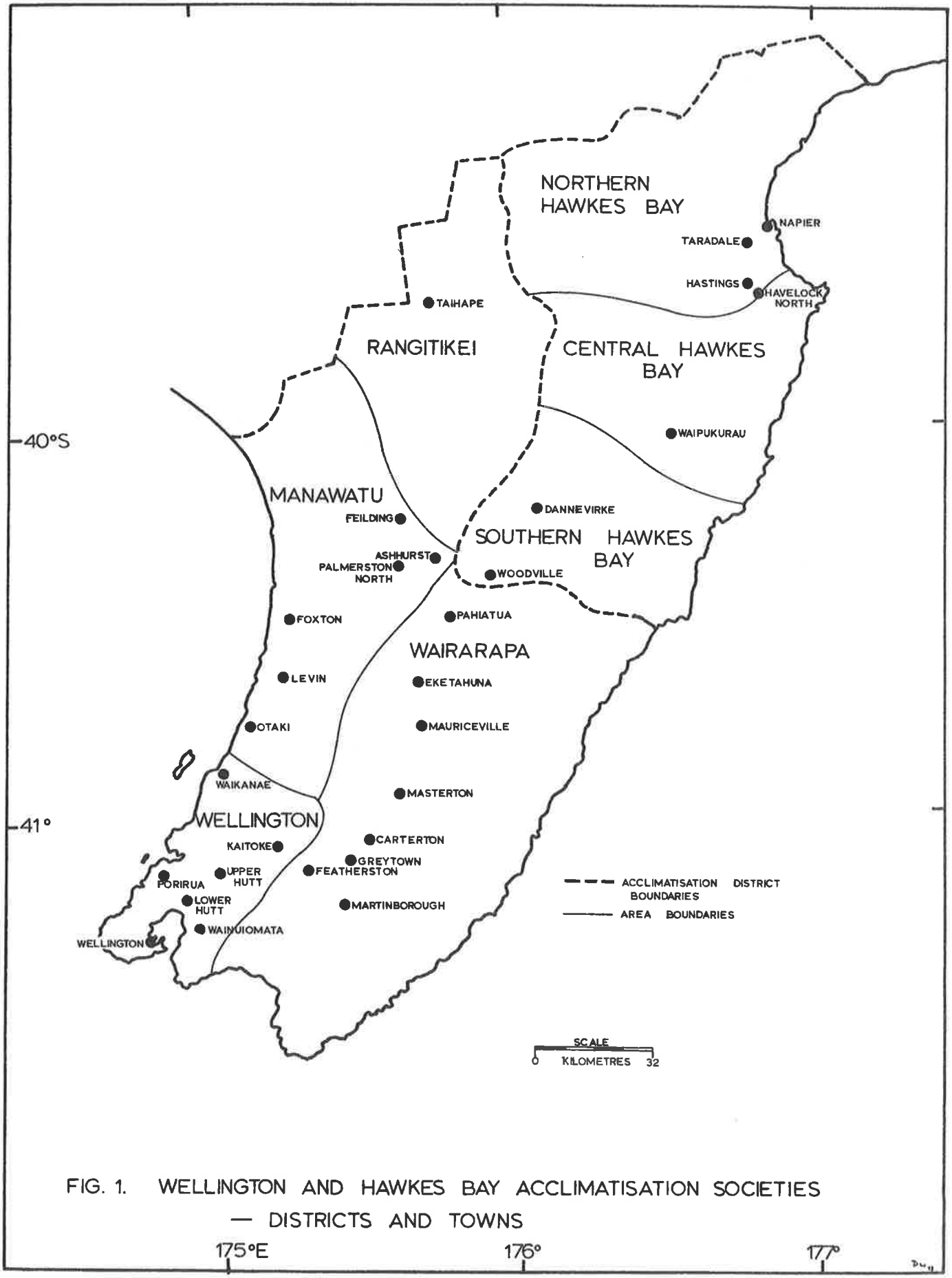


FIG. 1. WELLINGTON AND HAWKES BAY ACCLIMATISATION SOCIETIES — DISTRICTS AND TOWNS

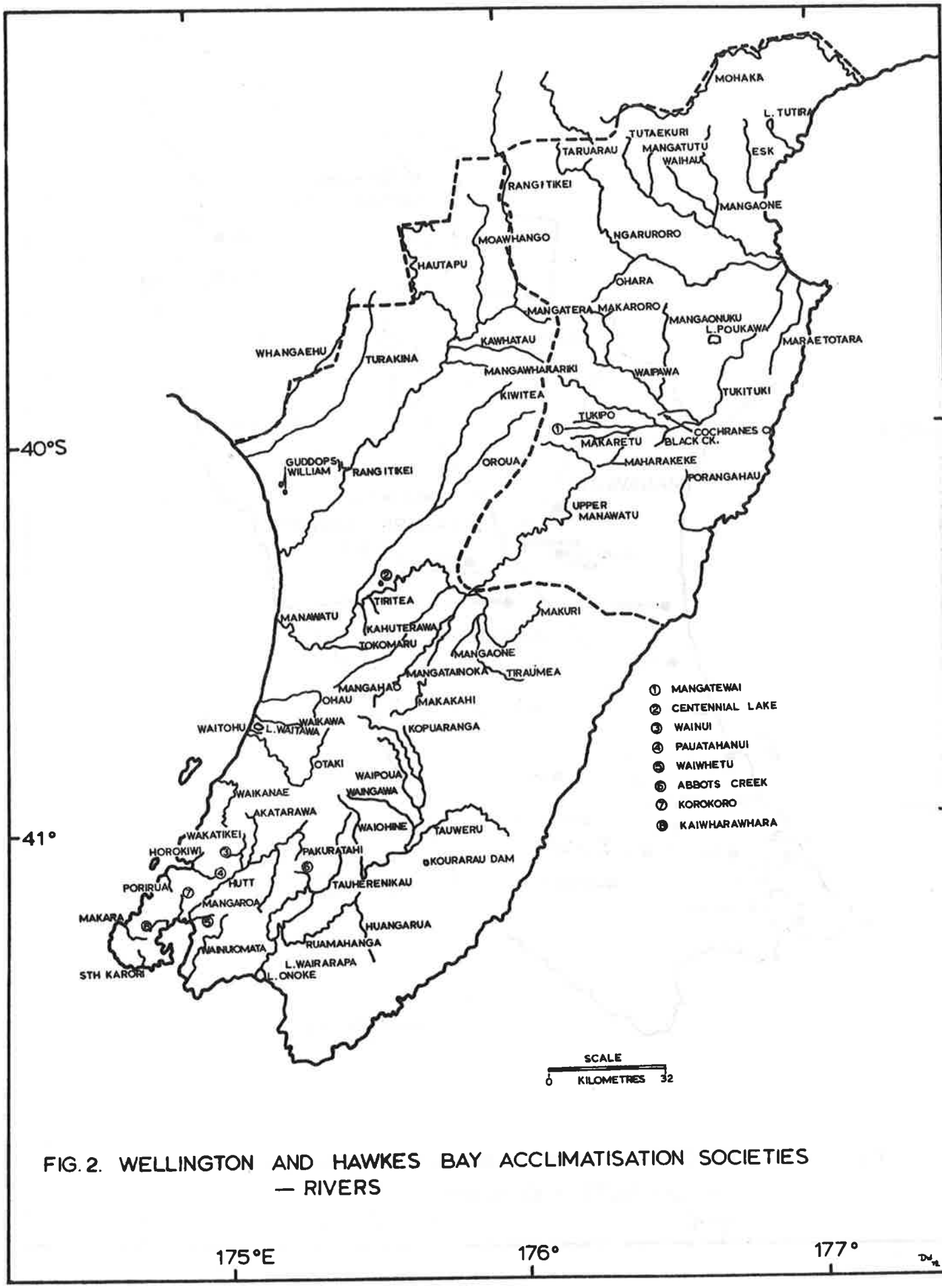


FIG. 2. WELLINGTON AND HAWKES BAY ACCLIMATISATION SOCIETIES — RIVERS

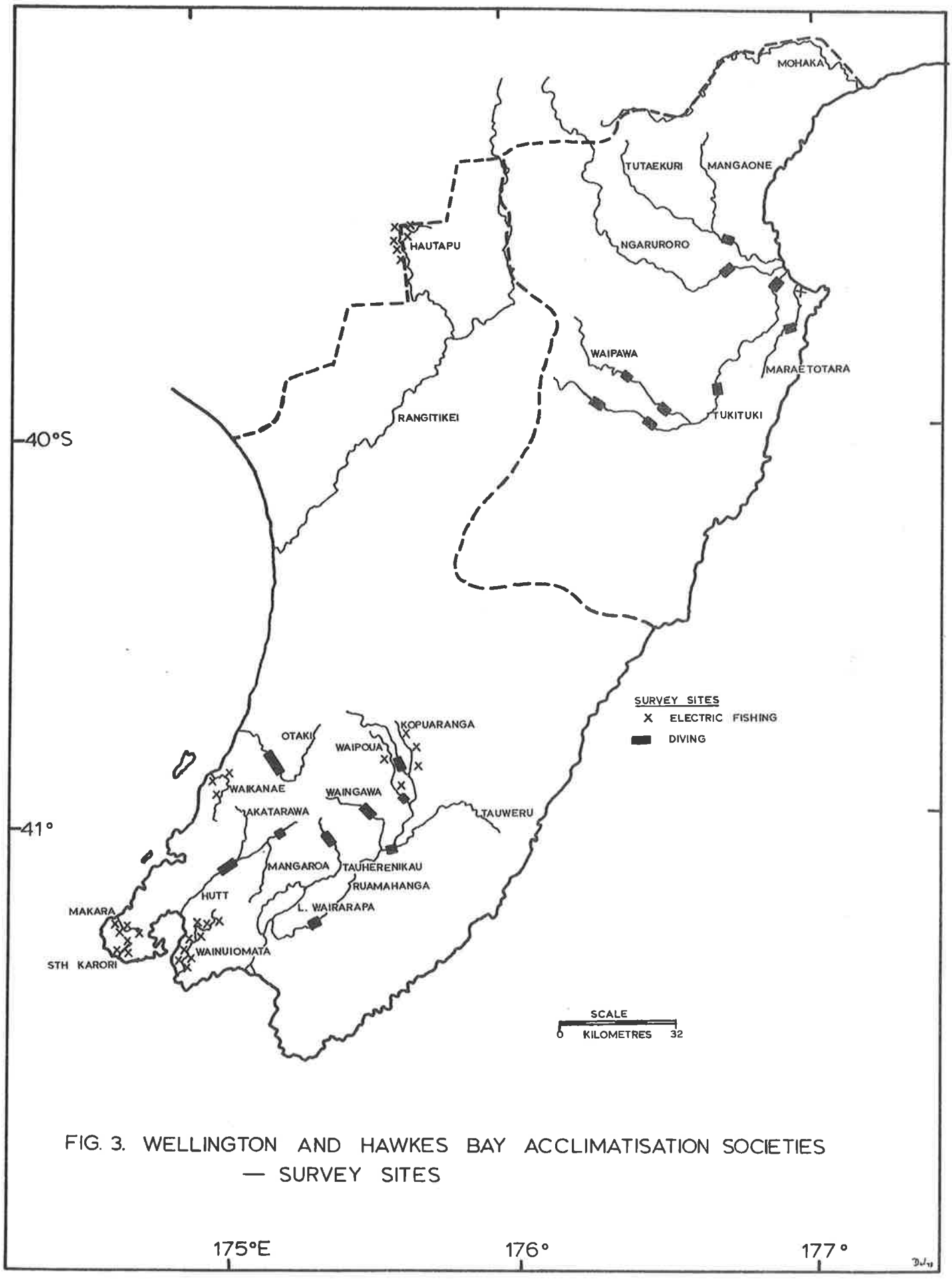
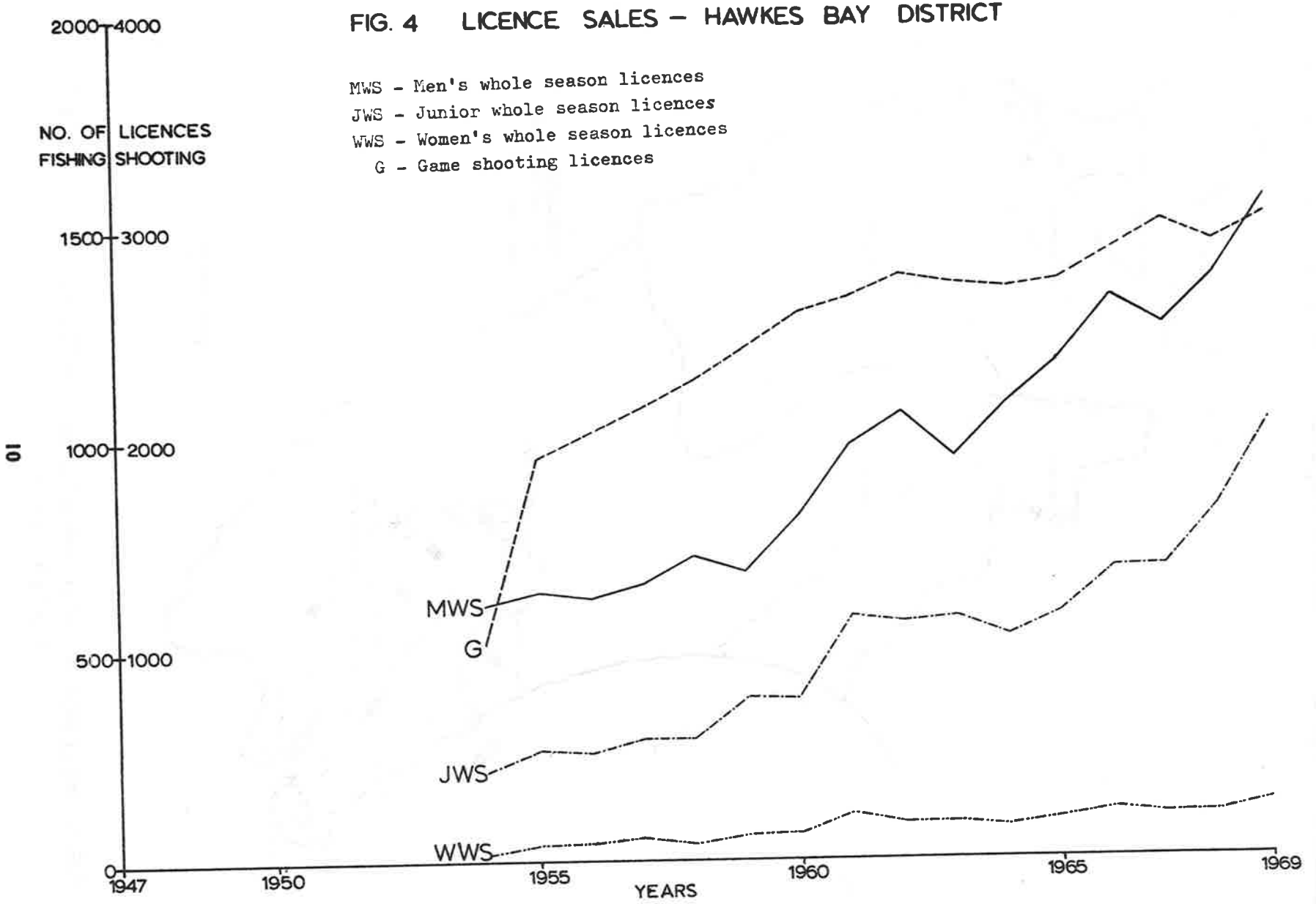


FIG. 3. WELLINGTON AND HAWKES BAY ACCLIMATISATION SOCIETIES — SURVEY SITES

FIG. 4 LICENCE SALES – HAWKES BAY DISTRICT

MWS - Men's whole season licences
JWS - Junior whole season licences
WWS - Women's whole season licences
G - Game shooting licences



In rural areas such as southern Hawke's Bay a larger percentage of the population are anglers (Table 1). The geographical distribution of all angling licence holders is not known, but it is believed that the 1962-63 diary scheme, in which a total of 133 diaries were returned, gives a fair picture of the distribution of anglers. As expected, most anglers live in the large towns of Napier, Hastings and Havelock North in the Northern Hawke's Bay region. From Table 2 it is possible to deduce that the increase in licence sales is due to increased sales in the towns, the number of rural fishermen probably remaining stable. Almost all the diaries returned from Central Hawke's Bay in 1947-52 were from members of one angling club.

Because the diarists tended to fish the rivers close to their homes, only the 1962 diary results were used to give estimates of the angling effort and crop in various waters.

The anglers' effort, catch and catch rate are greater in Southern and Central Hawke's Bay than in the Northern region (Table 3). This is a reflection of the better angling quality and good access to the waters in these regions.

Whole season licence holders who live in other Acclimatisation Districts rarely fish in Hawke's Bay. Their fishing accounts for approximately 5% of the angling time and 7% of the fish caught. 80% of these anglers come from Wellington District. Hawke's Bay anglers often fish in other districts such as Wellington, Rotorua and Taupo.

The Average Angler's Fishing Effort and Catch

Most Hawke's Bay anglers fish for only one or two days each season, but as some keen anglers fish for up to 150 days a year, the mean men's whole season licence holder's angling effort is around 14 days to catch about 7 fish per season (Table 4). It is unlikely that the mean angler's effort and catch have changed over the past twenty years. The evidence for this comes from the angling diary scheme, the relevant results of which are summarised in Table 5.

TABLE 1

Comparison of Popularity of Angling in 1962-63

Regions	Wellington District		Hawke's Bay District		
	Wellington and Hutt	Wairarapa	Southern	Central	Northern
Males over 18 (1961 Census)	84,328	9,972	3,920	4,034	23,074
Approx. M.W.S. Licence Sales	737*	355*	296†	200†	464†
% of M.W.S. Licences in Population	0.87	3.56	7.55	4.96	2.01
Average Angler's Effort Days/Season	17.4	16.9	19.4	23.0	14.5
Average Angler's Catch Rate Fish/Day	1.0	1.7	0.96	0.95	0.83

* From 1968-69 Distribution of Wellington Licence Sales

† From 1962-63 Hawke's Bay Diarists' Distribution - based on 133 diaries only.

M.W.S. - Mens Whole Season Licences

TABLE 2

Geographical Distribution of All Diaries Returned in Hawke's Bay District

Region	1947-52		1957-58		1962-63		1067-68		Distribution of Males over 18	
	No.	%	No.	%	No.	%	No.	%	1961%	1966%
Nthn. Hawke's Bay	2	5	19	44	58	44	38	60	74.4	76.5
Central " "	35	83	5	11	25	19	12	19	13.0	12.0
Sthn. " "	0	0	12	28	37	28	4	7	12.6	11.5
Other Areas or Unspecified	5	12	7	16	13	10	9	14		
TOTAL	42		43		133		63			

TABLE 3

Average Hawke's Bay Mens Whole Season Diarists' Effort, Catch and Catch Rate by Region of Residence 1962-63

Region	No. Diarists	Fishing in Hawke's Bay			Fishing in Other Districts		
		Days/ Season	Fish/ Season	Fish/ Day	Days/ Season	Fish/ Season	Fish/ Day
Northern	44	14.48	12.02	0.83	0.32	0.57	1.79
Central	18	23.0	21.89	0.95	1.0	1.78	1.78
Southern	28	19.39	18.57	0.96	2.86	2.86	1.00

TABLE 4

Effort and Catch of Hawke's Bay Anglers by Licence Category Derived from 1962-63 Diary Scheme and 1963 Wellington District Questionnaire

Licence Type	Hawke's Bay District			Other Districts		
	Days/ Season	Fish/ Season	Fish/ Day	Days/ Season	Fish/ Season	Fish/ Day
Men's Whole Season	13.61	7.46	0.55	4.2	7.5	1.8
Womens " "	11.93	4.06	0.34	4.8	0.5	0.1
Childs " "	17.73	2.84	0.16	0.8	0.1	0.1
Half Season	9.74	2.24	0.23	-	-	-
Monthly	7.50	1.50	0.20	-	-	-
Weekly	3.17	0.48	0.15	-	-	-
Daily	1.00	0.15	0.15	-	-	-

TABLE 5

Annual Effort and Catch of Men's Whole Season Diarists from 1947 to 1967

Year	1947-52	1957-58	1962-63	1967-68
Men's WS.Lic. Sales	605 (in 1951-1952)	657	1064	1270
Diaries Retd.	47	34	92	37
% Return	1.55*	5.18	8.65	2.91
Mean Days/ Season	36.1	20.12	17.31	18.62
Mean Hours/ Season	104.7	55.1	51.9	57.5
Hours/Day	2.90	2.74	3.0	3.09
Mean Fish Kept/Season	39.9	16.65	15.60	16.08
Fish/Hour	0.38	0.30	0.30	0.28
Fish/Day	1.11	0.83	0.90	0.86

* Scheme ran for 5 years

The 1947-52 results are not strictly comparable as only a few keen anglers from the Waipukurau area sent in diaries. There is no statistical difference between the diarists' catch, catch rate or the number of fish caught for the years 1957-58, 1962-63 and 1967-68 and it seems unlikely that there has been any change. The calculation of the average angler's effort and catch from those of the diarists is complex and is described in Graynoth (1973). Basically, consideration has to be given to the fact that the anglers who return diaries are generally keener and more skillful than average. Correcting factors for Hawke's Bay have been derived from the Wellington questionnaire scheme of 1963, which compared the average licence holders to the diarists. The average effort, catch and catch rates of the various licence categories are shown in Table 4. In general, although Hawke's Bay anglers spend a little more time fishing than Wellington anglers, they catch fewer fish because of the lower catch rates.

The total angling effort and catch in Hawke's Bay District is assumed to be proportional to the licence sales. Estimates of the district effort in the years 1951-52, 1957-58, 1962-63 and 1967-68 are 14,000, 19,000, 30,000 and 34,000 days respectively and the catch 5,800, 7,200, 11,300 and 13,000 trout respectively. These figures include the small amount of angling effort by visiting whole season licence holders from other districts. The continual increase in the crop is rather worrying, and limitations may have to be imposed in future if licence sales continue to increase at the present rate.

Most of the angling effort is in the first few months of the season and in summer, as found by Allen and Cunningham (1957) and as shown in Table 6. The extension of the angling season in recent years has not been a large success since the rivers in winter become unfishable.

TABLE 6

Seasonal Effort and Catch of all Diarists in Hawke's Bay District in 1962 and 1967

Month / Year	% Days		% Catch		% Undersized Fish		Catch/Hour		Hours/Day	
	1962	1967	1962	1967	1962	1967	1962	1967	1962	1967
October	25	24	25	24	10	10	0.32	0.32	2.8	3.2
November	20	13	20	9	14	3	0.33	0.31	2.7	2.4
December	10	9	8	9	18	2	0.24	0.38	3.0	2.5
January	11	18	10	17	26	26	0.28	0.33	2.9	2.8
February	10	10	9	10	28	51	0.26	0.28	3.1	3.3
March	9	11	12	13	27	47	0.37	0.36	3.4	3.2
April	14	9	14	13	41	44	0.27	0.54	3.3	3.2
May	Closed	2 Closed		1 Closed		70 Closed		-	Closed	-
June	"	3 "		2 "		40 "			"	
July	"	2 "		2 "		5 "			"	

The Best Waters to Fish

This is largely a matter of personal preference but the anglers recorded the highest weight of fish caught per hour from the Manawatu and Maraetotara rivers which contain brown trout. The rainbow trout fisheries had lower rates of catch and the fish were smaller (Table 7).

TABLE 7

Best Waters for Angling Overall
Based on Men's Whole Season Diaries

Water	Catch Rate Fish/Hour	Average Weight of Fish Kg	Kg/Hour
Mohaka	0.16	1.4	0.22
Lake Tutira	0.20	1.1	0.22
Tutaekuri	0.26	0.7	0.17
Mangaone	0.16	0.75	0.11
Ngaruroro	0.32	0.75	0.23
Tukituki	0.30	0.8	0.23
Waipawa	0.33	0.75	0.24
Maraetotara	0.30	1.4	0.40
Manawatu	0.42	1.1	0.47

THE FISH STOCKS

Establishment and Distribution of Species

From the records published in the Centennial Report of Hawke's Bay Acclimatisation Society it seems that brown trout were first liberated in the Manawatu by Captain Hamilton in 1872. It is possible that some brown trout were also liberated in 1876. The first definite liberations in Central Hawke's Bay were in 1883 and by 1886 brown trout were established in the Manawatu and Ngaruroro and possibly in the Tukituki. By 1892 brown trout were well established.

Quinnat salmon were first liberated in 1877, but this and all further liberations were unsuccessful.

The American brook char, *Salvelinus fontinalis* were introduced into the upper Ngaruroro at Kuripapango in 1883 and by 1888 the Society was advertising their ova for sale. At present no existing stock is known. Whitefish ova were introduced in 1880 but died without being released. Perch were introduced into a dam at Elsthorpe prior to 1883 and in recent years (1962) more were distributed in various waters in the district. Present regulations, in banning live bait, virtually prevent their capture. Crucian carp were introduced in Lake Poukawa prior to 1876. They could be a useful forage fish in Lake Tutira as they proved to be in the Rotorua Lakes.

The first rainbow trout, now the predominant species, were probably obtained from the ova which Auckland Society sent in 1902, ten years after brown trout were established. By 1905, the initial increase in numbers and size of the brown trout in the Manawatu, noted always after introduction into virgin waters, had faded and the fish were reported to be deteriorating in size and condition. It would appear then that rainbow trout were introduced into rivers containing near the maximum stock of brown trout.

Despite this, rainbow trout, as in Taupo, have become predominant and ousted the earlier established brown trout in the majority of the waters in the district. By 1913-16 the brown trout comprised 30% of the anglers' crop in Central Hawke's Bay (I.W.N. Mackie's records). Since that time there has been a steady decrease in the numbers of brown trout caught by anglers and the situation is not as stable as described by Allen and Cunningham (1957). In 1920-25 the Tukituki was reported to be "full of brown trout" (a letter on Marine Department file). By 1947-52 they comprised only 9% of the catch, in 1957-58 7% and in 1962-63 and 1967-68 2% of the catch.

The present distribution and recent changes in some waters are discussed below.

Mohaka

Brown trout have been recorded since 1962 but have been in the river for many years. Overall composition of the catch is 83% rainbow and 17% brown trout.

Lake Tutira

This lake used to hold a predominantly brown trout population as indicated by trapping records (Investigation Report 1). With changing land usage in recent years, the only spawning stream, Sandy Creek, has become silted and only a few trout manage to spawn there. Brown trout are selectively killed at the Sandy Creek trap and with the lack of natural spawning, the Society's releases of rainbow trout fry have become relatively more important and few brown trout are caught at present. The percentage of brown trout in the anglers' catch has dropped since 1957-58 from 16.6% to 4% in 1962 and 3.5% in 1967.

Esk

This river contains only a few brown and rainbow trout.

Tutaekuri

The only records are from 1957-58 to 1967-68 when brown trout comprised 2.2% of the catch. Its tributaries the Waihau, Mangaone and Mangatutu showed a similar catch composition.

Ngaruroro

Records from 1947 to 1967 show the percentage of brown trout (1.9%) in the catch to be slightly lower than in the Tutaekuri. The Ohara produced only rainbows from the anglers' catch records but from the Taruarau two browns and eight rainbows were recorded.

Tukituki

As described earlier, from the anglers' catches and other information, there seems to have been a marked drop in the percentage of brown trout caught.

The Waipawa possibly shows a similar drop from 18% in 1947-52 to 5.9% in 1957-58, 5.2% in 1962-63 and 6.7% in 1967-68, but fewer fish were caught there. During the drift dive survey two brown trout and 38 rainbow trout were seen there. These were the only brown trout seen during the surveys of the shingle rivers in the area. For some reason brown trout seem to be more common in this river than in others.

Other tributaries vary in the percentage of brown trout in anglers' catches. From the Mangaonuku anglers recorded one brown and fifteen rainbows, from the Makaroro ten rainbows only and from the Maharakeke 28 rainbows and 3 browns. In the Tukipo 34 rainbows and 10browns were recorded (the brown trout all being caught in 1947-52), in the Mangatewai 2 rainbows only and in Black Creek 15 rainbows and 3 browns.

Maraetotara

In this river, running due east of the Tukituki, 98% of the anglers' catches were brown trout.

Manawatu

1,114 brown trout and one rainbow (caught in 1967-68) were recorded by the diarists in the Hawke's Bay portion of this river.

The most likely explanation for the domination of rainbow trout in the rivers in the middle and northern areas of the North Island (Allen and Cunningham 1957) is that they have a greater tolerance to high water temperatures. The shingle rivers of Hawke's Bay were noticeably warmer than those in Wellington District during the diving surveys in January and February.

The temperature tolerances are not a complete answer as other species differences such as behaviour are certainly important. The distribution could also be correlated to the presence of hard water rich in calcium salts (MacMartin 1962).

It is important to investigate the factors affecting the brown and rainbow trout distribution because rainbow trout are preferred as a sports fish by most anglers and the Acclimatisation Societies spend large amounts of money on stocking waters which may be unsuitable. There are a number of small spring fed streams such as Black Creek in Central Hawke's Bay where populations of brown trout coexist with rainbow trout and an ecological study of the reasons for the distribution in this district could be very interesting.

The Size and Growth Rates of Trout

There has been little change in the size of fish caught in Hawke's Bay District since 1947-52 (Table 8). The drop in the size of rainbow trout in Lake Tutira is possibly due to eutrophication (Fish 1963) but may be also attributable to increased stocking.

In the Manawatu brown trout were larger in 1957-58, 1962-63 and 1967-68 than those caught in 1947-52. This could be caused by anglers fishing different localities in the river or various other reasons not related to the size of the trout in the river.

TABLE 8

Variations in Size of Trout Since 1947

Water	Species	Average Length cm	Approx.Avg. Weight Kg (CF 120)	Size Change
Mohaka	Brown	53	1.8	Stable
Mohaka	Rainbow	41.4	0.9	Stable
L. Tutira	Brown	58	2.4	Stable
L. Tutira	Rainbow	47.2-43.9	1.3-1.0	Sharp decrease since 1962-63
Tutaekuri	Rainbow	38.4	0.7	Stable
Mangaone	Rainbow	39.4	0.7	Stable
Ngaruroro	Rainbow	39.1	0.7	Stable
Tukituki	Rainbow	40.4	0.8	Stable
Waipawa	Rainbow	39.6	0.7	Stable with 4cm fluctuations
Maraetotara	Brown	48.3	1.4	Possibly slight increase
Manawatu	Brown	45.7	1.1	Increase from 38cm in 1947-52 to 46cm in 1957 to 1967

The consistency of the average size of rainbow trout between rivers and the years in the shingle Central and Northern Hawke's Bay rivers is remarkable. There is only a 2cm or 0.1Kg difference between the Tutaekuri, Mangaone, Ngaruroro, Tukituki and Waipawa rivers. This would indicate that the fish populations are similar and could be managed by similar means. The consistency in the size of fish in the Tukituki dates from 1920 and therefore little change is expected in the future.

All angling methods catch trout of similar size except in the Tukituki River and Lake Tutira where wet fly methods possibly catch larger fish than spoon.

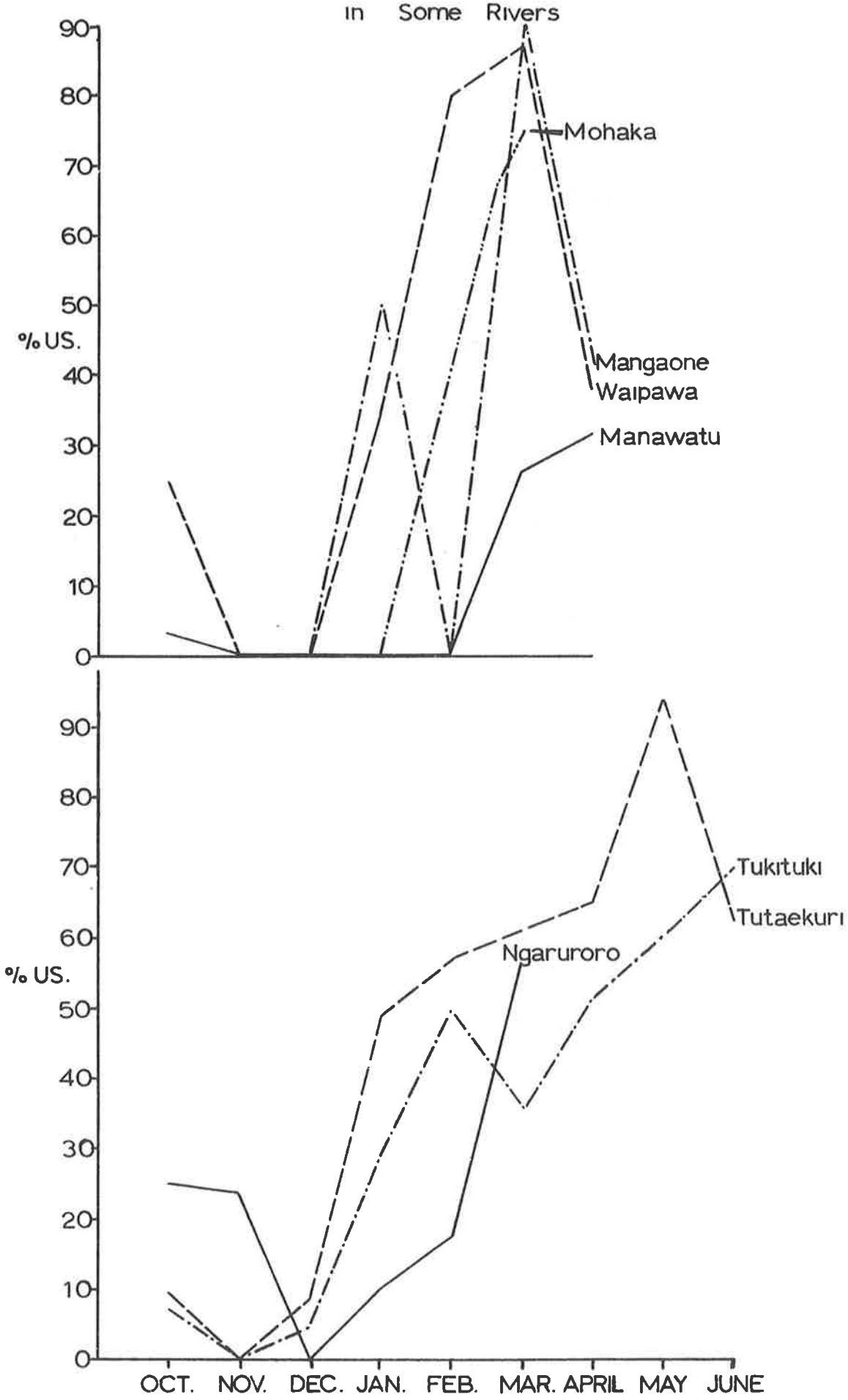
In the larger rivers the average size of trout caught can change with locality. In the Ngaruroro and Tukituki the trout caught in the lower and upper reaches are 1.5cm larger than in the middle reaches. In the tributary rivers anglers recorded larger trout towards their source.

Seasonal changes in the size of fish occur in some rivers. In the Manawatu there is a slow increase in the size of fish caught through the season from 43 to 46cm. A steady size increase was shown in the Tukituki, Tutaekuri and Waipawa rivers. In the Ngaruroro River the size of fish caught decreases through the season. It seems that this is because small 'pan sized' silvery rainbow trout are caught in the summer months in the lower reaches (Centennial Report).

The percentage of undersized fish in the anglers' catch increases through the angling season (Table 6 and Fig. 5).

In most countries the age of trout can be determined by noting checks in growth on scales or bones and relating these to annual climatic changes, fish migrations or spawning. Due to the temperate climate of New Zealand, trout in this country show a fairly even rate of growth through the year with occasional summer and winter checks in growth. Scale reading is therefore a very unsatisfactory ageing method.

FIG. 5 Percentage Undersized Fish (US.) in Anglers' Catch in Some Rivers



By the end of the first year's growth rainbow trout are about 18cm in length. The evidence for this is derived from a few scale readings by Mr K.R. Allen, from personal observations of the size of fish in the rivers in February and from the increased numbers of undersized fish and fish just over the size limit of 25cm coming into the catch later in the year. It seems from the tag records that rainbow trout at the end of their second year in rivers will be approximately 38cm long and by the third year 43-48cm long. The rainbow trout have a comparatively short life span and seem to die off rapidly around 56cm in length at the age of four years plus. Tagged rainbow fingerlings, when released in Lake Tutira, are smaller than naturally produced fish at the same age. Unless undue selection of the larger tagged fish by anglers has occurred, by the end of the second year of age these fish average 41cm and by the third year 48cm, after which their growth stops (Fig. 6). This growth is virtually identical to that of tagged fish in Lakes Okataina and Rotoehu, in agreement with the hypothesis that fast growth rates in eutrophic lakes can be achieved at low stock densities (Fish 1968).

The Stock and Anglers' Crop of Trout

The trout stocks of some Central Hawke's Bay rivers in February 1971 were estimated by drift-diving surveys. Rainbow trout densities were very low (Table 9). As over 50% of the catch from these rivers is taken by February, anglers appear to crop from 50 to 90% of the available stocks.

These low stock densities and high anglers' crops need to be confirmed and if they are typical of the current situation, it may be advisable to reduce the anglers' catches to some degree.

The crop of trout was estimated from the proportion of the 1962-63 diarists' catch for each water. Estimated 1962-63 crops from the Manawatu, Mohaka and Mangaone rivers were 3871,221 and 205 respectively and from Lake Tutira 355 fish. The present catches may well be different from these estimates.

FIG. 6 GROWTH RATE OF TAGGED RAINBOW TROUT IN LAKE TUTIRA

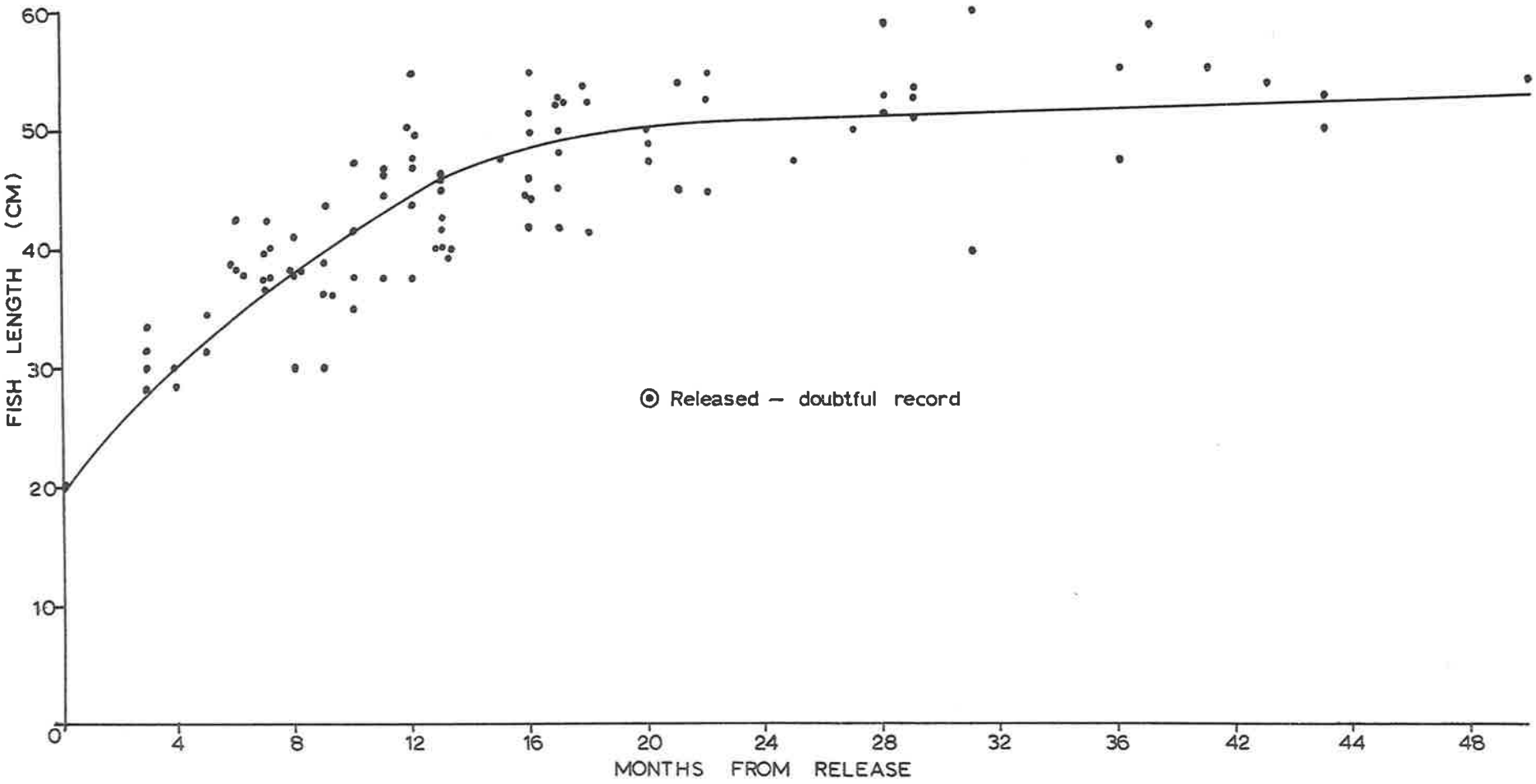


TABLE 9

The Abundance of Catchable Trout in Hawke's Bay Rivers

River	Estimated numbers per Km at survey sites	Estimated* Stock Feb. 1971	Estimated* Crop 1962-63
Tukituki	8, 1, 2, 31	1295	3539
Waipawa	28, 11	776	845
Ngaruroro	31	1358	1130
Tutaekuri	12	405	276
Maraetotara	0, 40, 6	385	260

* These estimates are approximate, 95% confidence limits can be over $\pm$ 50% from the figure shown

The changes in trout abundance can only be estimated from changes in catch rates. No significant differences in catch rates were recorded between the 1957-58, 1962-63 and 1967-68 angling diary schemes, the average catch rates for the various waters being recorded in Table 7. The trout densities, however, may well have changed without having any noticeable effect on catch rates (Graynoth 1973).

The Spawning Grounds and Hatchery Liberations

Some surveys of the extent of the trout spawning grounds have been made by the Society Officers and there appear to be excellent spawning areas in many rivers. During the drift diving surveys large numbers of fingerling rainbow trout averaging about 200 per kilometre were observed in the Tukituki, Ngaruroro and Tutaekuri Rivers. No fry were liberated in the winter of 1970 and these fingerlings were the result of natural reproduction.

The Central Hawke's Bay rivers have been extensively stocked with hatchery reared fry and fingerling rainbow trout for many years. This was against the advice of scientists from the Marine Department, who at various times stated that these liberations were a waste of time and money. In the years from 1962 to 1967, 2,700 fingerling rainbow trout were tagged by the Society, of which only 9 takeable fish were recaptured. Only two tagged trout were reported caught from liberations of 2,500 fingerlings into the Manawatu River system from 1966 to 1969. As a result of these studies, the Society no longer stocks these waters with hatchery fish.

From 1960 to 1968, 2,378 tagged rainbow trout fingerlings were released in Lake Tutira. The comparative success of these liberations is striking; ninety eight of these tagged fish were captured. Their growth rate and the number of months from release to capture is shown in Fig. 6. By comparison with the rivers, in Lake Tutira the tagged fish are caught over a much longer time of more than three years and they survive long enough to grow to a good size.

Angling Regulations

Bag Limit

The present bag limit is 15 acclimatised fish, the same as in 1947-52. In 1,030 days angling recorded in 1967-68, this was achieved only once by an angler fishing the mouth of Sandy Creek in Lake Tutira with wet fly. The limit was never achieved in 2,124 days angling in 1962-63. Therefore, the bag limit has no restrictive action on the catch of fish. If it was to be used to reduce the catch effectively, it would have to be lowered to two or three fish a day. The approximate percentage reduction of the anglers' catch can be calculated from Allen (1955) and Allen and Cunningham (1957).

Size Limit

The minimum size of trout which can be kept is 25.4cm (10 inches) in all rivers. Large numbers of undersized fish are caught in some shingle rivers such as the Waipawa. These fish come into the catch in December or later, before reaching one year of age and they do not reach the size limit till about November in their second year.

Method Restrictions

Live bait fishing is generally banned and so is the use of threadline equipment in some small fly waters like the Maraetotara and Mangaone. I feel that if the crop needs to be restricted it would be far better to have a bag or size limit rather than method restrictions which discriminate against unskilled anglers and actually prevent the capture of fish in some streams such as the Maraetotara.

In general, all angling methods are of equal effectiveness but if it was thought that worm would be too effective against rainbow trout (T. Orman, pers. comm.), a bag limit of 2 rainbow trout caught by this method could be imposed to conserve the stocks in some localities.

Again Allen and Cunningham (1957) and Allen (1955) should be consulted for more details of the effectiveness of angling regulations.

Closed Season

The winter fishing season in the Tukituki, Tutaekuri and Ngaruroro river systems allows the angler to catch the sea run brown trout during their spawning migration. However, few fish are caught because the rivers are often in flood.

THE WATERS

The nine waters discussed below were chosen on the basis of their popularity. Thirteen other waters which were fished by diarists in 1962-63 were not analysed because the data received were insufficient.

The Hawke's Bay Acclimatisation Society's Centennial Report (1968) contains excellent descriptions of these rivers with good advice on angling techniques and localities.

Mohaka River

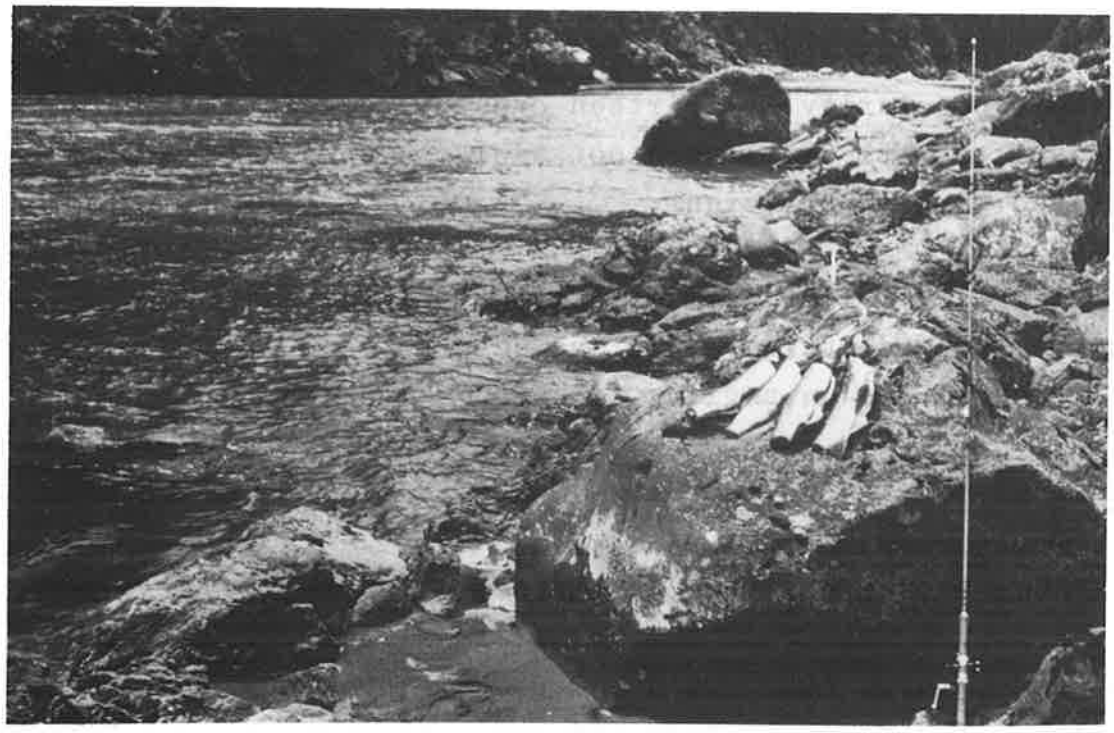
This is the northern most river in Hawke's Bay. With its origin in the Kaimanawa mountains, this river flows 135 kilometres due east through dense bush and gorges into the Bay north of Lake Tutira. The river is snow fed and cool, having a boulder bed in the upper reaches with shingle, silt and pumice lower down. Because it flows through the bush, access is limited and it is fished only in a few areas. It does not suffer from pollution or any marked eutrophication at present.

Rainbow trout weighing on average around 0.9Kg at 41.4cm in length are caught. Brown trout, although probably as abundant especially in the upper reaches, are caught less frequently and their average size is 53cm and 1.8Kg. There is no evidence of any depreciation in size through the years.

Quinnat salmon have been released into this river by the Society without success and the Internal Affairs Department is at present trying to develop a run of "steelhead" rainbow trout there. The catch rates are poor at 0.16 fish per hour, possibly due to the 6 to 7 hours per day anglers spend fishing (Allen and Cunningham 1957). Spoon techniques are more popular than wet fly methods.

Mohaka River - Four Rainbow Trout

(G. Rusbatch)



Mohaka River - National Publicity Studios

Lake Tutira

This lake, with a surface area of 178 hectares and a maximum depth of 42 metres, is situated about 40 kilometres north of Napier and is a popular holiday fishery. The lake is eutrophic with occasional algal blooms. As mentioned before brown trout have become scarce. It is thought that rainbow trout stocks are also low and the stocking rate has been increased to 20,000 fingerlings per annum.

The catch rates seem to improve after Christmas and wet fly catches fish slightly faster than the spoon, by either trolling or from the shore, which is the most popular method.

The possibility of liberating silver carp, *Hypophthalmichthys molitrix* to reduce the algal blooms is being studied by the Ministry of Agriculture and Fisheries and the Society.

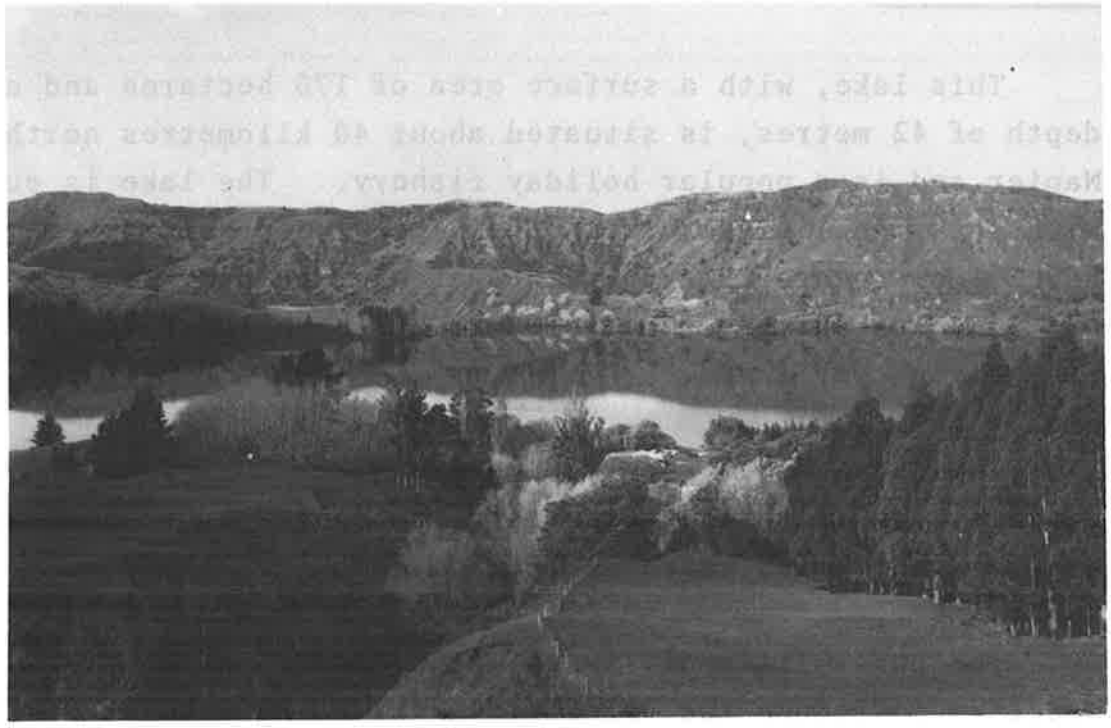
Tutaekuri River

This medium sized river rises in the Kaweka Ranges and runs due east through Taradale south of Napier. In the lower reaches it is a shallow unstable and braided shingle river. In the upper reaches it is fairly inaccessible with steep banks and large boulders. Shingle works in the lower reaches discolour the water. The spawning grounds are believed to be good.

Rainbow trout are mainly caught and they average 38.4cm in length or 0.7Kg in weight. Some sea run brown trout ascend this river to spawn. Smelt are abundant. The fish density in the area surveyed was low and this maybe related to the river's instability.

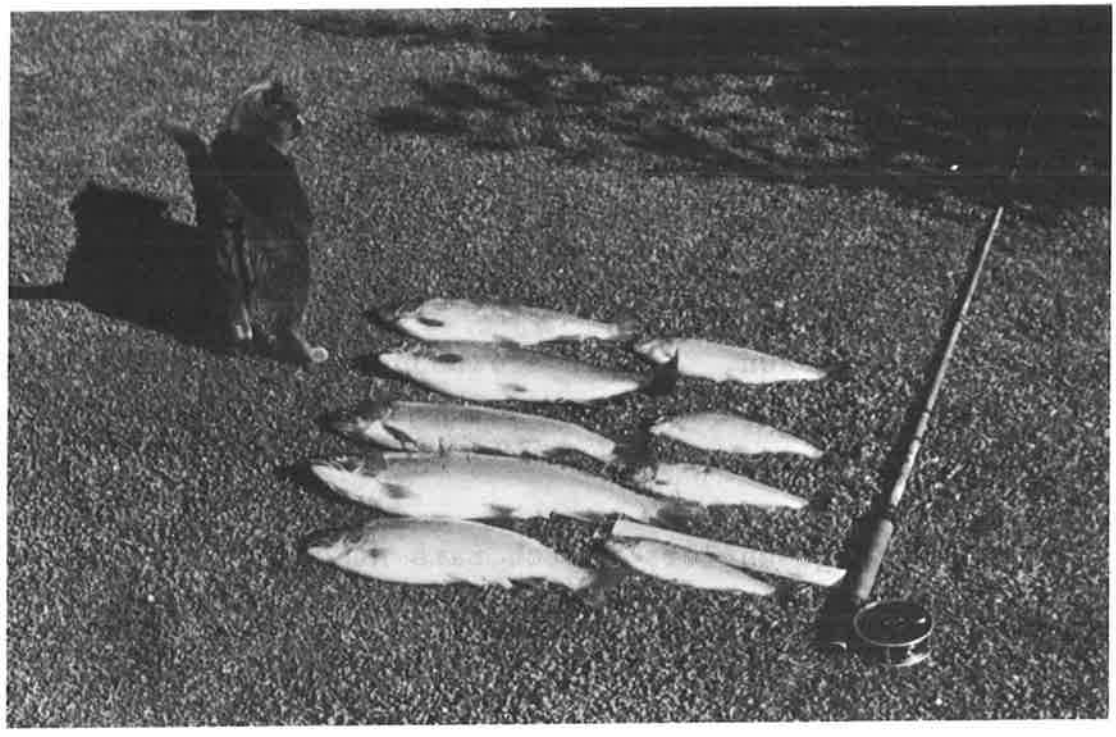
The average anglers' catch rate at 0.26 fish per hour is slightly lower than for the other shingle rivers. Wet fly is the most popular and successful method followed by spoon and minnow.

Lake Tutira (National Publicity Studios)



Tutaekuri River Rainbow Trout

(L.W. Spooner)



The Mangaone

This tributary of the Tutaekuri is approximately 30 kilometres long. It is a good trout spawning stream as it is shallow and fairly stable. It flows mainly through private property and is not easily reached.

Mainly rainbow trout were caught by the diarists and at 39.5cm (0.7Kg) they were larger than those in the main river.

The anglers' catch is estimated at 200 fish, but it is not known what proportion of the stock this constitutes. The anglers' average catch rate is low at 0.16 fish per hour. Wet fly is the most popular method but spoon, now an illegal method, was also used quite often.

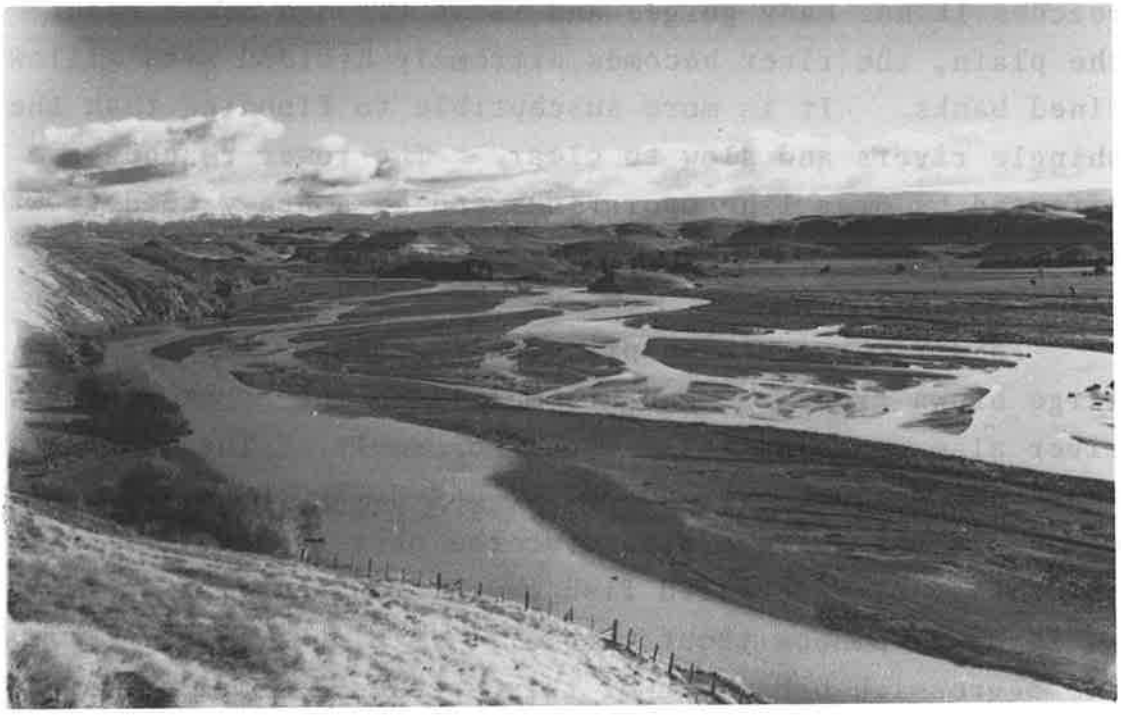
Ngaruroro River

This 100 kilometres long river flows east from the Kaimanawa Mountains, south of the Tutaekuri River. In the upper reaches it has many gorges and flows through dense bush. On the plain, the river becomes extremely braided with willow lined banks. It is more susceptible to flooding than the other shingle rivers and slow to clear. The lower reaches are affected by drag line operations and by a heavy weed growth in summer.

This river contains principally rainbow trout. Only a few large brown trout are caught, mainly in the upper reaches. The river also contains large shoals of smelt. The rainbow trout caught by anglers average 39.1cm and 0.7Kg in weight with no change in the average size over the past twenty years. The percentage of undersized fish caught (35%) is fairly high. As in most rainbow trout waters it is high probably because of the aggressive behaviour of this species. Small brown trout are rarely caught in waters of this type.

Ngaruroro River at Kuripapango (G. Rusbatch)

Ngaruroro River - Middle Reaches
(National Publicity Studios)



The catch rate is typically about 0.32 fish per hour. The catch rate using spoon techniques drops rapidly upstream from 0.6 plus fish per hour in the tidal reaches to 0.18 from 32 to 48 kilometres inland. As the spoon catch rate drops that of wet fly increases. There is possibly a drop in spoon's catch rate and an increase in wet fly's catch rate during the angling season but this could be due to differences in the localities fished by diarists.

There is no evidence of deterioration in fish numbers in this river.

Tukituki River

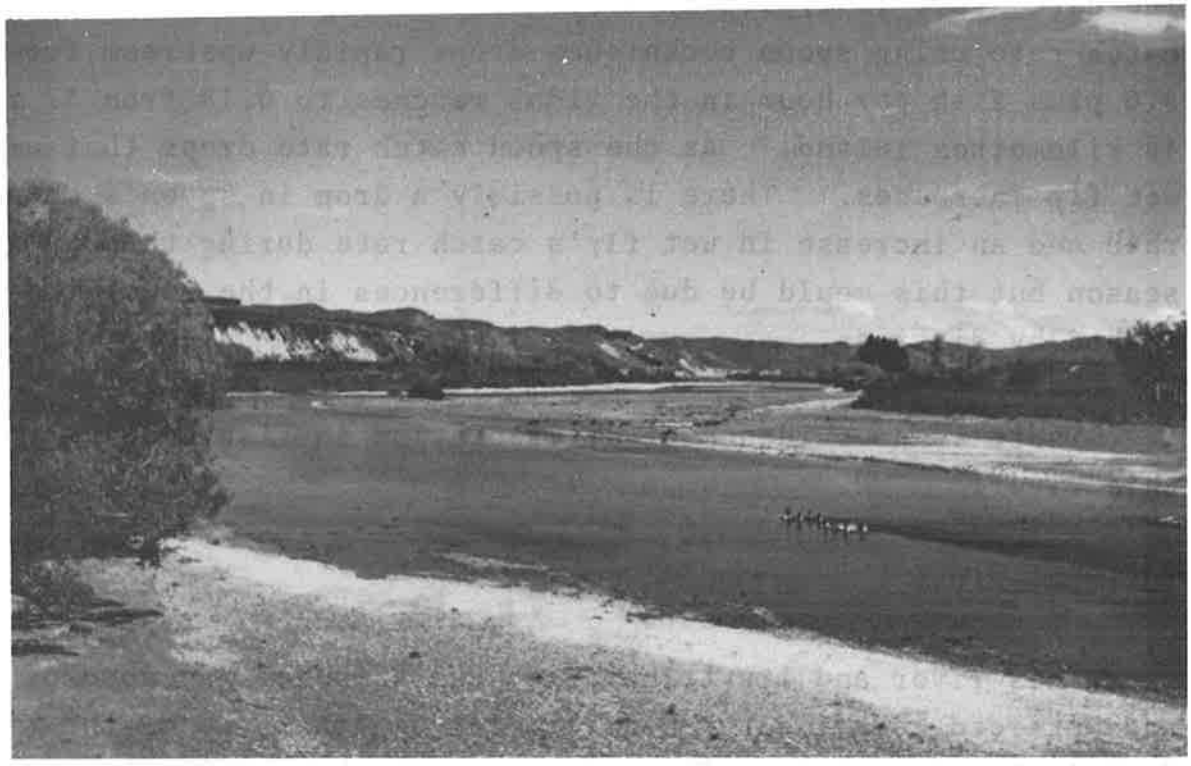
This river and its tributaries the Waipawa, Mangaonuku and Makaretu comprise the most popular angling area of the Hawke's Bay District. The main river is about 110km long and has a papa and shingle bed but is less braided than the Ngaruroro and Tutaekuri. There are problems with weed growth and drag line siltation in this river.

As shown earlier the number of brown trout caught has declined through the years. Yellow eyed mullet, eels and smelt are abundant and sea run brown trout are present.

The rainbow trout average 40.4cm and 0.8kg in weight. It is possible that they were smaller, at about 0.55kg in weight, in 1921-31. The fish caught by anglers become larger towards the end of the season and also seem to be larger in the lower and uppermost reaches. Large brown trout can be caught in the lower reaches.

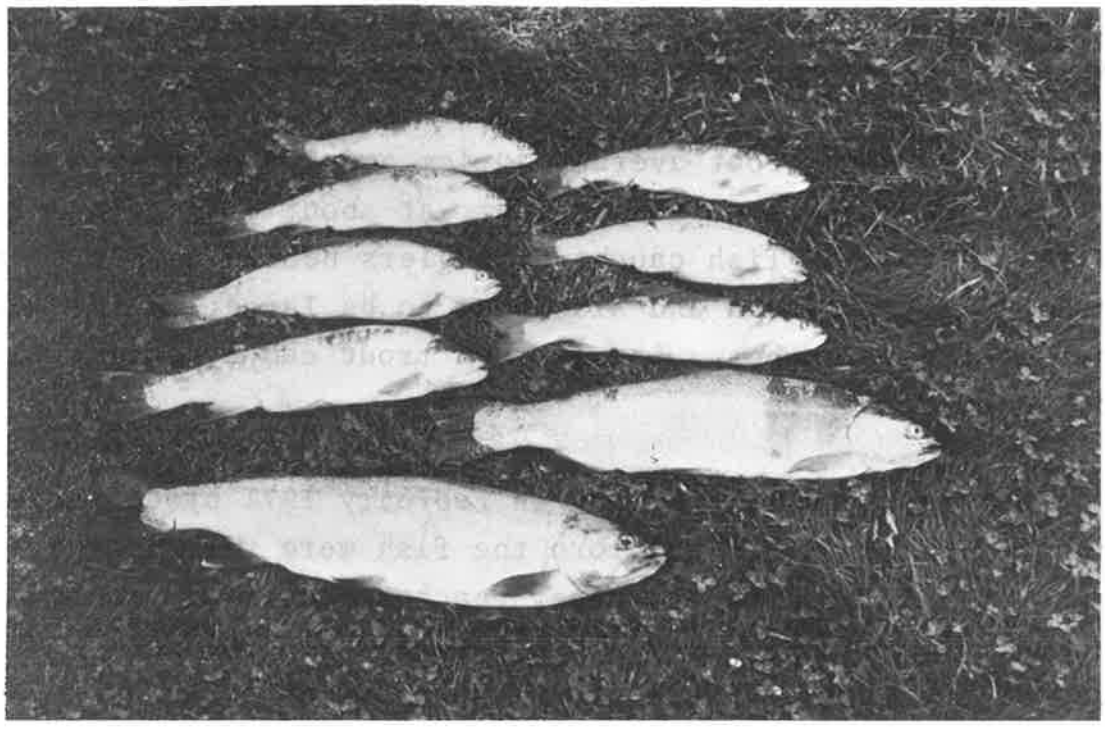
During the diving survey in February 1971 by comparison with the Waipawa and Ngaruroro the fish were very scarce, especially in the shallow upper reaches above Waipukurau. The reasons for such scarcity are not clear, it could be caused just by the lack of cover or by intensive angling.

Tukituki River



Tukituki River - Rainbow Trout

(L.W. Spooner)



There are marked differences in the catch rate by locality and method. Dry fly is said to be the best method overall but the diarists' results did not show this. In the lowest 16 kilometres and from 64 to 80km upstream spoon has a markedly higher catch rate than wet fly. In the middle reaches i.e. from 16 to 64km upstream, wet fly at around 0.30 fish per hour is consistently better than spoon at 0.20 fish per hour. In the upper reaches i.e. 64-80km from the sea, all methods show a higher catch rate than elsewhere in this river around 0.4 fish per hour. Seasonal changes in catch rate are not marked probably because of the locality changes. Dry fly seems to be used after Christmas. Unlike most rivers this one is fished evenly through the year.

Waipawa

This 50km long northern tributary of the Tukituki is similar in type to the main river. There is a predominance of rainbow trout in the anglers' catches but brown trout seem to be commoner than elsewhere. The rainbows average about 39.6cm and 0.7kg in weight with slight fluctuations from year to year. There has been no decline in size for the past twenty years. Smelt are common but eels are scarce except in the tributaries. Sea run brown trout spawn in Cockranes Creek.

The catch rates recorded by men whole season diarists since 1947-52 have been 0.34, 0.33, 0.33 and 0.35 fish per hour. The catch rate possibly drops through the season from 0.42 in October to 0.15 in February. It is doubtful whether the fish density has changed over the years. During the diving survey, the Waipawa had a noticeably higher population of trout than parallel reaches of the Tukituki and in general this would seem to be related to the greater cover available. There were more deep pools and areas such as recesses behind flood debris where trout were found. Rainbow trout were also seen in some runs of quite rapid flow at midday which is unusual in other rivers.

Overall, the population of this river from Waipawa to the Makaroro River was estimated at 800 fish or 5.7 fish per hectare. Only two brown trout were seen, the larger of which was approximately 40 cm long and in poor condition and was just off the river bottom. The divers noticed that rainbow trout are more free swimming than brown trout and very rarely rest on the bottom. They are also more difficult to count underwater, as they are far more shy than brown trout which in some rivers can be captured by hand if approached slowly.

Maraetotara

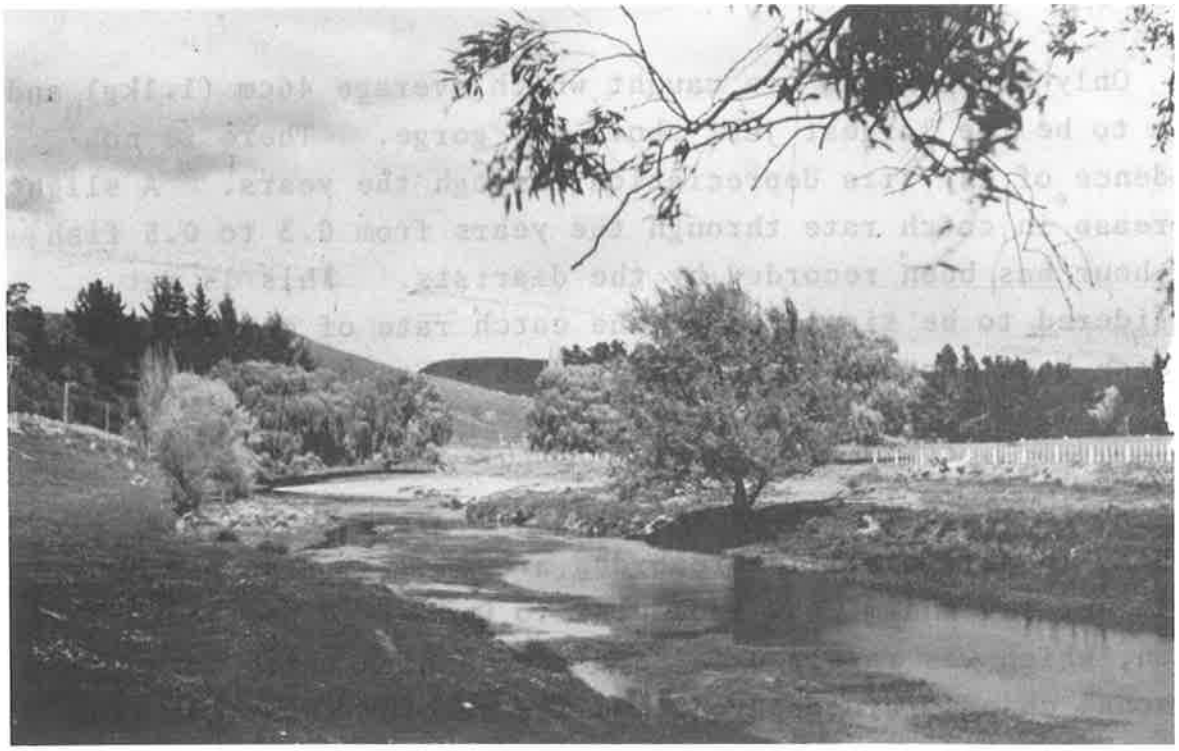
This river flows through farmland parallel to the lower Tukituki but is of a very different nature. It is approximately 6 metres wide and up to 5 metres deep with cold clear alkaline water. The anglers catch brown trout averaging 48cm (1.3kg) at catch rates averaging 0.30 fish per hour. Dry fly catches fish at a consistently faster rate than wet fly, 0.32 compared to 0.22 fish per hour. Most angling is done after December.

The Maraetotara was electric fished in the lower reaches where only smelt and torrent fish were caught. Along the Ocean Beach road, 11 kilometres from the mouth, where the river is badly overgrown with willows, a high density of large brown trout was found by diving. It was estimated that in this section there were around 50 trout per hectare and many large eels, the whole river, however, containing only about 400 adult or catchable trout at that time (February 1971).

The Upper Manawatu

The upper river from the source to the Manawatu gorge is approximately 80 kilometres long. In the lower reaches access is good and the river is heavily fished. The numerous small upper tributaries, often willow covered, afford excellent spawning conditions and the water is cool and clear. The main river is up to 45 metres wide with the bed mostly in shingle but with papa in some areas.

Maharakeke River



Upper Manawatu River

(National Publicity Studios)

Only brown trout are caught which average 46cm (1.1kg) and seem to be the largest just above the gorge. There is no evidence of any size depreciation through the years. A slight increase in catch rate through the years from 0.3 to 0.5 fish per hour has been recorded by the diarists. This is not considered to be significant, the catch rate of the average licence holder probably remaining stable at about 0.42 fish per hour.

There are differences in catch rate by method. Dry fly fishing in all localities recorded around 0.58 fish per hour, while wet fly and minnow from 0.32 to 0.34 fish per hour. Spoon, which was rarely used, recorded a high catch rate. Seasonal changes are apparent and the records show that from Christmas to the close of the season all methods become more effective, the average catch rate rising from 0.20 to 0.50 in April.

FISHERIES MANAGEMENT

Some previous fisheries management practices such as hatchery liberations into rivers have been shown to be ineffective and were stopped, whilst others such as the prevention of water pollution and abstraction are of continuing importance.

Discussions have been held with the Council of the Hawke's Bay Acclimatisation Society on the fisheries management practices proposed in a draft of this report. There was a certain amount of disagreement on some matters, however, a general conclusion was reached that more information was needed on some topics before final decisions could be made. The Society has therefore initiated a data collection programme prepared by the Ministry of Agriculture and Fisheries (R. Little, pers. comm.).

I consider it doubtful whether any additional information is required on the characteristics of the anglers in this district because of the long term stability shown in many features by the angling diary scheme. The emphasis should be on biological studies and collection of information on the fish stocks and recruitment, by electric fishing the smaller tributaries and drift diving surveys of the larger rivers.

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I have received much help and general advice from Mr R. Little and Dr D. Eggleston who both read and criticised a draft text. Field assistance was given by the late Mr P.J. Allen, Messrs G. Clarke and P. Webb. Also valuable criticism of the draft text was made by the Council and Staff of the Hawke's Bay Acclimatisation Society and Mr W. Skrzynski.

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MINISTRY OF AGRICULTURE AND FISHERIES

FISHERIES TECHNICAL REPORT

No. 114

THE HAWKE'S BAY TROUT FISHERY

E. GRAYNOTH

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