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PRELIMINARY REPORT ON THE PROPOSAL TO ESTABLISH TROUT-REARING PONDS IN THE NORTH CANTERBURY DISTRICT 1952.

PROPOSAL:

To meet some particular local needs in the maintainence of trout stocks in certain back-country lakes in the North Canterbury district it has been proposed that rainbow trout fry be reared to a more advanced stage than is done at present, before liberation.

To do this efficiently and economically the fry would need to be reared under controlled conditions in ponds of simple construction and in which they would be encouraged to grow by utilising the natural foods produced in the water.

The advantages and disadvantages of such a proposal are discussed herein.

HISTORY:

Since 1944 rainbow trout eggs - about 300,000 annually - have been hatched for the North Canterbury Society at the Ashburton Society's hatchery. The resulting fry, reared to a stage where the yolk-sac is almost absorbed have then been transported and liberated in the following back-country lakes:-

Lake Lyndon	Lake Georgina
Lake Pearson	Lake Grasmere
Lake Coleridge	Lake Ida

The established procedure has been to release the fry, more or less straight from the shelter of the hatchery box, into new surroundings with new food supplies and conditions and into immediate competition with well established wild stocks. What effect these changes have on the survival of the fry is unknown.

A general opinion is held that the release of fry in some lakes has had had little worthwhile effect although no evidence, with one exception, has been brought forward to show whether these releases have, or have not, made an improvement to the existing stocks.

The exception is Lake Lyndon. Investigational work undertaken by Professor Percival has produced some evidence which shows that stocking with fry has been satisfactory and has a substantial effect on the stock. However conditions in Lake Lyndon are peculiar to that water. It is ~~virtually a self-contained~~

normally a self-contained body od water without an outlet and with almost no known spawning grounds.and is therfore dependent on artificial stocking aid.

During the liberations of 1946, 10,000 fry were placed in a temporary pond on the Greendale property to test the suitability of the water for fish-rearing. The following year 200 were recovered and released in Lake Georgina. Unfortunately no record of the size or weights attained has been given although it was stated that at the end of four months the absence of artificial feeding had not appeared to retard development which was apparently normal.

In 1948 a total of 16,000 rainbow fry were placed in four ponds in the district:-

Hororata Domain pond	10,000
Stones pond	5,000
Gorton's pond	500
McLay's pond	500

Of these, 50 (10%) were later netted from Gorton's pond as yearlings averaging 6 inches in length. The fate of the others is obscure.

The following year saw three more pond liberations:-

Gorton's pond	500
Greendale pond	500
Wood Bros pond	500

Neither the Woods or Greendale ponds were successful and Gorton's pond yielded only one trout - a fish of 10 inches.

Bayfields, a virgin pond, was stocked with 5,000 fry and Gorton's with 1,000 during 1950. We have no information from Gorton's pond but the Bayfields pond liberations resulted in two fish recovered - of 14 ins. and 15 ins. respectively.

None of the ponds were specifically designed for the rearing of trout and in consequence no great successes were achieved. Natural feeding was relied upon throughout. Gorton's pond, which had the highest recovery rate of fish, was a shallowish, circular tank fed from a small water seepage; the water temperatures became high in summer and there was a thick mud bottom supporting a heavy growth of water-weed. It was small and difficult to net thoroughly.

Bayfields, where the biggest rate of growth occured, was a much larger, natural pond lying in a depression, with no inlet (bar seepage) and no outlet. It was relativley deep, had a population of large bullies and could not be drained to enable the fish to be completely removed.

A site on the Waimakariri river at Brown's Rock was examined in 1950 with a view to the construction of suitable ponds. This project was abandoned after investigation showed the difficulty of constructing ponds on the terrain and because of the ~~si~~ remoteness of the site for proper supervision.

Another site was chosen for investigation , again on the Waimakariri river, this time at Shipleys on the old South Branch. To date this site appears to have a number of advantages over the others examined, namely: closeness to supervision (7 miles from Christchurch) yet inacessible to the public through being on private land; good supply of spring-fed water; easier possibilities of construction and the room for future expansion if needed.

A preliminary survey of this area was made in December 1951 and the following report deals with matters arising therefrom.

DESCRIPTION:

The area covered by this survey forms part of an old channel of the Waimakariri river. On old maps the channel is shown running south of four islands, McCleans, Baillies, Templars and Coutts. The Waimakariri River Trust constructed a large stopbank across the channel above Harewood and diverted the water into a main channel away from the South Branch (Map 1).

The South Branch did not dry up completely. Down the old watercourses a good volume of water still flows as the result of seepage from the main river through the porous shingle sub-strata. Flooding is only likely to occur with abnormal conditions such as a major flood breakthrough of the main river stopbanks.

The water, which is a sizable stream when it rejoins the main river at White's bridge, carries a plentiful stock of brown trout and eels. The trout are known to spawn alnong most of the length of the stream and its tributaries.

The particular part examined lies north of Mr. Shipley's farmhouse and is on his property. (Map 2) It is a semi-waste land consisting mainly of shingle flats intersected by watercourses. The vegetative cover comprises gorse, broom, lupin, willows and grasses. Except for the grazing of sheep and the removal of shingle the land has little or no other use.(Photos)

Access is by a well-formed vehicle track commencing at the Shipley Farmhouse and traversing the whole area (Map 2)

STREAM CHARACTERISTICS:

Three separate streams enter the survey area as may be seen on Map 2. Each forms part of a well-braided pettern of

intersecting watercourses and have similar characteristics. Two of these are of particular interest as possible scources of water supply.

The flow was generally slow , varying from .75 ft/sec. on a flat to 2.0 ft/sec. on a stickle. The average flow was 1.5 ft/sec.

Graded shingle up to 3 ins. with stones to 6 ins. comprised the majority of the stream beds, finer gravels and sands were also present. The banks, mostly shingle with sands and silts, were in the main low except where the watercourses impinged upon the terraces of the old islands.

In the upper reaches growths of various water-weeds had almost choked the flow of water. Lower down weeds and algal growths were still thick, especially in the slower waters.

SURVEY DECEMBER 1951:

Mr D.F.Hobbs and the writer made a brief survey in December 1951. Three bottom samples and two trout samples were taken for analysis; an appraisal of possible pond sites and w water supplies made and a general appreciation of the area gained.

POND CONSTRUCTION:

Despite the fact there appear to be one or two places already existing on the watercourses, which, at first glance could easily be converted into rearing ponds, in practice this is not actually the case. Several difficulties arise, chief amongst these being:-

a. Obstruction to the existing natural watercourses.

b. Interference with the natural movement and spawning activities of the native trout stocks.

c. A great deal of weed removal, willow clearing and stream modification would need to be done.

d. Difficulties in the proper control of the waterflow and the adaption of the existing conditions to self-draining ponds which are necessary for the full haresting of the crop.

Therefore it is suggested that any ponds to be built be constructed on the land adjoining the stream where all factors could be controlled from the beginning.

A "raceway" type of pond is considered the most suitable. In this type of pond a flow of water is maintained and conditions most closely approach those of a natural stream habitat.

Before a pratical design for a "race" type of pond can

be brought forward a physical survey of the proposed pond-sites (A on Map 2) must be made to see, amongst other things, if there is a sufficient fall between the projected inlet and outfall. This fall is needed to provide current through the ponds and yet still leave height for complete drainage.

Marked B on Map 2 is an existing backwater or old channel now almost dry, which possibly could be converted into ponds.

SCREENING:

The proper screening of both intake from the water supply and the outlet to the stream is vitally necessary. The trout being reared must be kept safely confined, entry of native stock from the stream prevented, as well as other predators such as eels.

It may not be possible to completely exclude eels, for recent investigations (Burnet) suggest that the smaller eels may be found buried in the shingle sub-strata 50 or more yards from the actual streams, having followed the water-table through gaps and crevices in the shingle. It will be seen therefore that no matter how perfect the screening is small eels may be expected to find there way into the pond. The larger eels can be excluded by screening and trapping. A new method (electrical pulse shocking) now under investigation shows considerable promise in the removal of even the small eels.

The screen best adapted to all needs appears to be a fairly recent development from California - the perforated plate, self-cleaning screen.

CATCHMENT BOARD:

The Catchment Board has several powers of control over the use or modification of a waterway. Before any final decisions are made the position under these powers would need cl clarifying.

YIELD FROM PONDS:

It is not possible to state with any degree of accuracy what a given pond will produce in lbs. of fish crop. Under strictly controlled living conditions and diets as are obtained in hatchery rearing with artificial foods, reasonable predictions can be made. Our problem is of a different nature in that the trout are to be reared under almost natural conditions utilising the natural foods present. On this basis estimations cannot be made with any surety since there are several as variable factors which cannot be assessed.

Studies of overseas and New Zealand literature do not reveal any published results of similar methods of rearing. A recent publication by Mr. K.R. Allen on a study of a "wild" population of brown trout in the Horokiwi river - one of the

most exhaustive works of this nature yet undertaken - gives some indication of what happens with trout stocks under New Zealand conditions.

It is indicated that the factor which limits the growth of trout in this stream is chiefly the food available for growth.

Other factors such as predation and angling effect the numbers of trout but these do not concern our estimations except to reduce predation by cannabilism.

Therefore the factor with which we are to be principally concerned is the amount and type of food available for rearing.

It has been shown that trout depend for their first two years of life on foods derived from the bottom fauna of the streams. It has been found possible to ruoghly measure the amount of this type of food present in a stream as well as the species and amounts used by the fish, but it has not been possible to measure the amount of such foods any given area of streambed will produce in say a year. This is essential in attempting to assess what a given area of streambed will grow in terms of fish.

If we assume that conditions in the proposed ponds will equal those in the Horokiwi, i.e. a bottom fauna standing crop of .5 gms. sq/ft. wet weight and similarly useful species, we might be able to expect an annual production of approximately 480 lbs. of fish to the acre. If conditions were better, or worse, we could expect a corresponding increase or decrease.

Translated into terms of 6 to 7 inch fish this means about 2,000 trout per acre or approx. 8,000 at the half-year.

It is pointed out that the 480 lbs. of fish to the acre is as approximate an estimate as can be given - conditions will vary considerably with different waters. However this figure could be taken as an outside estimate. Any increase due to the absence of predators would need to be taken into account.

RECOMMENDATIONS:

1. In view of the many uncertainties which are evident in the knowledge of successfully rearing trout under natural conditions it is recommended that a thorough investigational approach to the problem be made.

2. It is further recommended that as a first step in pond construction an accurate physical survey be made in which land slopes, water flows, water supplies, sites for intakes and ponds and allied matters be properly derermined.

3. The most suitable type of pond for these conditions be designed.

4. It is also recommended that the that the first pond constructed be a small one run on a "pilot-plant" basis where systematic observations and experiments could be made. On such information as could be gathered by these means it would be possible to decide whether trout rearing by natural methods is feasible.

5. An unequalled opportunity exists to carry out controlled investigational work where an attempt can be made to measure some of the factors which influence the growth of trout in New Zealand. Nowhere else in the country has there ever existed a better chance to help find out by observation, note and experiment at least part of the answers to questions about growth, survival and the effect of environment on trout under natural conditions.

CONCLUSION:

There is no doubt that some fish can be grown by the proposed method. How many can only roughly estimated. The project should be examined in the light of 2,000 fish per acre of water.by natural means. To impound an acre of water in ponds with their attendant screens and works is a sizable job and would require a good deal of expenditure in money.

C.J.Hardy,

Field Officer.

SOUTH BRANCH - WAIMAKARIRI RIVER.

SHIPLEYS SECTION.

Data on bottom fauna samples - gut contents etc.

SAMPLE 3.

27.12.1951. Old redd, shingle up to 3".

1. Deleatidium (Mayfly)	-	145	
2. Potomapyrgus (Mollusc)	-	53	
3. Pycnocentria (Caddis)	-	31	
4. Ryacophilides (Caddis)	-	22	2 pupa
5. Oxythira (Caddis)	-	10	
6. Nematines (Worm)	-	7	
7. Chironomids (Diptera)	-	6	
8. Oligochete (Worm)	-	1	
9. Paracalliope (Gam. Shrimp)	-	1	
		276	

Sample taken with a "Mrs Simpson" sampler.

STOMACH CONTENTS.

Sample 1. Length 8¼" Weight 9 ozs. Sex. Male, Brown.

Pycnocentria (Caddis)	-	37
Green Manuka Beetle	-	3
		40