

FRESHWATER FISHERIES ADVISORY SERVICE

MARINE DEPARTMENT

INVESTIGATION REPORT

JOB NO. 7

ACCLIMATISATION SOCIETY DISTRICT: Otago

TITLE OF JOB: Investigation of Shag River.

OBJECTIVES: To determine the state of the trout stock in the Shag River and to determine the factors affecting the well-being of the stock.

FINDINGS:

This investigation was carried out between January and March 1958.

Physical Features

The Shag River rises on the southern slopes of the Kakanui Range and follows a south-easterly course to the sea. The course is winding and flows at first through narrow gorges until approximately two miles above Dunback township, when the stream enters the Shag Valley. It flows through the valley slower than in the gorges and it finally enters the sea about two miles below the main road. For the purposes of this survey, the stream was divided into sections according to its physical features, which were numbered from the mouth up.

Section 1

This section extends from the mouth to the Main Road bridge at Bushey. The stream flows through a wide valley, over one mile across. The banks are about 2-3 feet in height and covered mainly with grasses and scrub, except nearer the sea, where the vegetation is of the salt marsh type. There are also clumps of willows near the upstream end of the section.

Near the road, the stream bed is composed of shingle and coarse sand, but the bed in the majority of the section is probably sand and mud. Bottom fauna near the road consists mainly of freshwater snail (*Potomopyrgus*). Further downstream the water was too deep to examine the fauna. Native fish are abundant, particularly *Galaxias attenuatus* (Inanga) and *Gobiomorphus* spp. (bullies). Also large shoals of yellow eyed mullet ascend the river with the tides. Approximately eight trout were seen just below the road bridge at

the time of the initial inspection and they were estimated to range from 1½ to 5 lbs in weight.

### Section 2

This section extends from the main road bridge to the Horse Range Road bridge.

The stream in this section follows a more meandering course, with deep holes and long slow-moving flats. The banks are up to 5 feet in height and are covered mainly with willows, which are often thick enough to make access to the stream difficult. Other bank vegetation is scrub and grass. In places the willows have grown right into the water and have the effect of seriously retarding stream flow and of causing scouring of the banks and bed in floods. The first mentioned effect has allowed deposits of silt to be formed in which aquatic weeds have taken root, causing further silting up of the bed. This gradual silting up is probably limiting trout food producing areas.

The bed of the stream is composed mainly of shingle with a small percentage of coarse sand. There are some good spawning areas in this section. The bed is mainly stable, although in two or three places there is a narrow shingle flood bed.

Bottom animals are abundant, the dominant species appear to be caddis and mayfly larvae and freshwater snails. There are large numbers of *Galaxias attenuatus* and *Gobiomorphus* sp. in this section. Several trout were seen, ranging in size from fingerlings to about 3 lbs.

### Section 3

This section extends from the Horse Range Road Bridge to the road bridge approximately 2 miles upstream from Dunback. The bed is more open and the stream generally shallower than Section 2.

The banks are up to 5 feet in height and bank vegetation consists of willows, scrub and grasses. The banks are not as stable as in the lower section, except for an area near Glenpark. There are shingle flood beds up to 25 yards wide.

The stream bed is composed of shingle with small amounts of stones and coarse sand. Bottom animals are moderately dense and caddis larvae appears to be the most abundant species. Approximately 2-300 bullies were seen but only a few *Galaxias*, especially above the weir, which is about half-way up this section. Several trout were noted, a few approximately 2 lbs in weight, but the majority appear to be under 1 lb.

In general this section is much more unstable than the previous one.

#### Section 4

This section extends from the bridge above Dunback to the source of the river. It consists of two gorges, separated by a short stretch of about one mile similar to Section 3.

The gorges are bounded by steep rocky cliffs up to 100 feet. Vegetation on the actual banks of the stream is mainly scrub and coarse native grasses. In places the banks are covered with piles of boulders that have fallen from the cliff faces. The bed consists mainly of rock and boulders, with areas of shingle and sand. The shingle areas are generally loose and shifting. There are some deep holes in the gorge area, some estimated to be 15 feet in depth.

Generally speaking bottom animals are almost absent and seem to consist mainly of freshwater snails (*Potomopyrgus*). A few bullies were noted, mainly in the back waters, and a few fingerling trout, at the lower end of the first gorge and at the headwaters.

Generally the gorge area appears to be unproductive because of an unsuitable and unstable bed.

#### Headwaters

Towards the headwaters of the stream the gorge becomes shallow and widens out to a narrow valley. The stream is more stable than in the gorge itself and bottom fauna is more plentiful, though still scarce, compared with the lower section.

The banks are stable, 1 to 2 feet high, and covered mainly with tussock and pasture grasses. The stream bed is composed of stones and gravel. Above the road bridge, the stream again becomes unstable for about half a mile, until it enters a narrow gully which continues until the source is reached.

There are some good spawning reaches in the headwaters of the river, and several small trout, up to 9 inches - 10 inches, were seen.

#### Pigroot Creek

This stream enters the Shag River about 5 miles below its source. At the road bridge the creek forks immediately above an overhanging fall about 4 feet in height. The creek is generally unstable and appears subject to severe flooding, though there appears to be patches of suitable spawning grounds below the road bridge.

### Other Tributaries

Two other small creeks, Green Valley Creek and Sweetwater Creek, were also examined and appeared to be useful nursery streams and several trout were seen in each. Green Valley Creek was fairly unstable immediately below the road - but otherwise provided good spawning water, as did Sweetwater Creek.

### Trout

Samples were taken of the trout population and the lengths, weights, and in some cases stomach contents were recorded. In addition to this, records of 18 trout caught by anglers were obtained and incorporated with the other data. In this way information on 72 trout was obtained.

#### (i) Condition

The condition of the trout examined was fair, condition factors ranged from 31 to 48, the average condition factor being 37. The larger fish, i.e., 2 lbs and upwards, seemed to be poorer in condition than those in the 10-12 inch group.

#### (ii) Stomach Contents

The stomach contents of 16 trout were examined. Results are as follows:

<u>Length</u>	<u>Weight</u>	<u>Stomach Contents</u>
18"	2 lbs	56 caterpillars 1 adult caddis 1 adult diptera
9½"	5 ozs	47 Olinga 37 Pycnocentria 1 Potamopyrgus
8½"	4 ozs	4 Olinga
9"	4 ozs	221 parnid beetles
9-3/4"	6 ozs	315 parnid beetles
12"	11 ozs	12 Olinga 6 Pycnocentria Ichneuman fly Dragon fly (Odonata)
11½"	10 ozs	2 brown beetles 1 Deleatidium
10½"	8 ozs	Unidentified small fish - approximately 2"
10½"	8 ozs	14 parnid beetles 1 Hydropsyche
9½"	5 ozs	2 Pycnocentria 4 Olinga
19½"	1½ lbs	1 beetle 9 caterpillars
14½"	1 lb	21 caterpillars 6 Chironomid larvae 4 beetles

(ii) (Cont'd)

<u>Length</u>	<u>Weight</u>	<u>Stomach Contents</u>
12½"	12 ozs	146 Deleatidium 52 Pycnocentria
14½"	1½ lbs	20 Potamopyrgus 3 Pseudonema 2 Pycno Xanthagrion larvae (Damsel fly)
16½"	1 lb 11 ozs	1 Archichauliodes 1 cicada 2 damsel flies 6 Hydropsyche 1 Chironomid larvae
12"	9 ozs	58 parnid larvae 127 Pycnocentria

It is interesting to note that approximately 40 per cent of the trout stomachs examined contained terrestrial animals, e.g. caterpillars, beetles, etc.

The rest of the fish examined contained mainly caddis larvae, with a few mayfly larvae, freshwater snails and parnid beetles.

### (iii) Spawning Facilities

Generally, spawning facilities in the main stream are poor. There are some limited areas of suitable spawning water, mainly in Sections 2 and 3, and at the headwaters, but the best spawning water appears to be in small tributary creeks above Dunback.

On the whole, the water in the main stream is either too slow-moving or the bottom gravel too fine or unstable to provide suitable spawning conditions.

However, Sweetwater Creek, Green Valley Creek, Pigroot Creek and others, appear to provide good spawning beds.

### Eels

Eels were trapped in the river below Dunback, using eel pots baited with ox liver, and set at intervals of approximately 60 feet apart. This gives a 90 per cent removal of trappable eels, i.e., over 24" in length in up to three nights (Burnet).

Sizes of eels trapped ranged from 24" and 1½ lbs to 65" and 9½ lbs. According to trapping records, the eel population below the gorge is moderate at approximately 120 lbs per acre.

Of the 50 eels examined, only one had any trout remains in the stomach. This eel contained a 4½" trout and the remains of two others. One other eel had three bullies ranging from 2½" to 4" in length. Of the remainder 48 per cent had either bait or no food in the stomachs and 38 per cent contained mainly bottom animals. The following animals were found in the stomachs:

<u>Mayflies</u>	<u>Caddis</u>	<u>Diptera</u>
Deleatidium	Hydroptilid Pycnocentria	Chironomid larvae

Also found were creeper (Archichauliodes), freshwater snail, caterpillars, cicada, earthworms, water beetle (Dytiscus) and animal matter.

#### Bottom Fauna

Bottom samples were taken with a square foot bottom sampler in all sections of the river except Section 1, i.e., the tidal reaches. Altogether 26 series of samples were taken, making a total of 106 samples.

Results were as follows:

It will be seen in Table 1 that the bulk of the fauna is found in the ripples, except in the Section 4. Average per square foot in this section is comparable with that in the other two sections. However, it was noted that most of the animals were very small, i.e., this summer's hatch. During the winter, when the river was higher, many of these animals would probably be destroyed by the shifting of the unstable shingle bed. This would not be so prevalent in the lower reaches of the river where the bed is of a more stable nature.

Overall, the population appears to be light, but there are areas of greater density, up to 5-600 per square foot, mainly in Section 2. The bottom fauna of the Shag River is composed of the following species:

<u>Ephemeridae</u>	<u>Tricoptera</u>	<u>Coleoptera</u>	<u>Neuroptera</u>	<u>Mollusca</u>
Deleatidium Atalophlebia Ameletus Colorboriscus Ichthybotus	Hydropsyche Helicopsyche Hydrobiosis Hydroptilidae Pseudonema Olinga Pycnocentria	Parnidae	Archichauliodes	Potamopyrgus
<u>Plecoptera</u>	<u>Annelida</u>	<u>Diptera</u>		
Leptoperlidae Stenoperla	Oligochaeta	Chironomid Simuliidae		

Of these animals, three species make up just over 80 per cent of the total. These are the Mayfly (Deleatidium), 41 per cent, Caddis (Olinga, Pycnocentria, Hydropsyche), 20 per cent, and Parnid larvae, 10 per cent.

However, the larvae of the parnid beetle is a burrowing animal and is therefore not generally available to the trout (Allen, Bulletin 10), so that the mayfly and caddis larvae would be the most important trout food.

### Native Fish

Excepting eels, no specific observations were made concerning native fish, but they were noted incidentally with other work.

There appears to be a large population of *Galaxias attenuatus* in the river, especially in Sections 1 and 2, although there are fair numbers up as far as Glenpark weir. Above this point only three of these fish were noted.

On several occasions the larger trout were observed feeding freely on Galaxids.

There is apparently a fair population throughout the river of *Gobiomorphus* sp. (bullies) and these were noted mainly as young fish in the backwaters.

### Angling

A total of seventeen anglers were interviewed and data on their fishing was recorded. In addition to this, experimental fishing was done in order to gain additional information. Of the seventeen anglers, nine were successful in catching takeable size trout. A total of eighteen trout was taken by these anglers, but 50 per cent of these were taken by two anglers in one day. Sizes ranged from 10 inches and half a pound to seventeen and a half inches and two and a quarter pounds.

The number of hours fished totalled sixty-four, including estimated fishing time (twenty-eight hours). This gives a rate of catch of 0.64 trout per hour.

A total of fifty-one hours experimental fishing was done and fifty-five fish were caught. However, twenty-six or about fifty per cent were undersized. This gives a rate of catch of about 0.50 fish per hour, which is less than that attained by the anglers interviewed. The average rate of catch for the two sets of data is 0.56 fish per hour, which is somewhat less than average for this district.

It appears that after the New Year, when the river reaches its low summer level, the larger fish become wary and harder to catch. Most of the fish caught were in the 10-12 inch group, only eight being over fourteen inches.

CONCLUSIONS AND RECOMMENDATIONS

From the data obtained during the investigation, the following conclusions can be drawn:

1. Numbers of bottom animals on which the trout feed and therefore the numbers of trout are limited by the instability of large areas of the stream bed, particularly above Dunback and to a lesser extent by the silting up of the bed where there is excessive growth of willows.
2. The eels in the Shag River are mainly competitors with the trout for food.
3. The Shag supports a moderate population of trout, with a fair proportion of larger trout, i.e., over 2 lbs, but these are seldom caught after New Year owing to the low level and clearness of the water.

It is recommended that those willows that obstruct the flow of the stream be removed, and that protective works could be attempted, particularly from Dunback to the Horse Range Road Bridge.

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Technical Field Officer

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TABLE 1. Bottom Fauna

Average number of animals per square foot:

	<u>Ripple</u>	<u>Flat</u>	<u>Average Per Section</u>
Section 2	282	258	270
Section 3	255	197	226
Section 4	195	213	204

TABLE 2. Angling

17 interviews + experimental angling

<u>Total Hours</u>	<u>Total Catch</u>	<u>Undersized</u>	<u>Catch per hour of Takeable Fish</u>
115	96	39	0.48