DEPARTMENT OF CONSERVATION SOUTHLAND CONSERVANCY
UNPUBLISHED REPORT

THE WAIAU RIVER (SOUTHLAND) INANGA SPAWNING SURVEY 1994

by

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prepared for : Waiau River Working Party

Brief :

1. To locate inanga (Galaxius maculatus) spawning sites in the lower Waiau River;
2. To discuss how river flows may affect these; and
3. If sites are located, to suggest suitable protection/enhancement.

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INTRODUCTION

Inanga are the adult form of one of the five species of fish (family Galaxiidae, Galaxias spp.) which make up the "whitebait catch" in New Zealand (refer McDowell and Eldon 1980 and McDowell 1994). In Southland, including the Waiau River (fig 1), inanga appear to make up the greatest proportion of the catch (McDowell 1994) (Mitchell unpublished). For example in 1993 inanga accounted for 68% and 87.7% in samples of Waiau whitebait checked by Charles Mitchell and Bob McDowell respectively. This makes inanga the most important species for the recreational whitebaiters on the Waiau. (NB: While it is recognised that whitebait caught on the Waiau is sold, it is legally regarded as an amateur fishery controlled under the "Whitebait fishing regulations 1994). Inanga also have cultural significance having been an important food source for the maori (McDowell 1991).

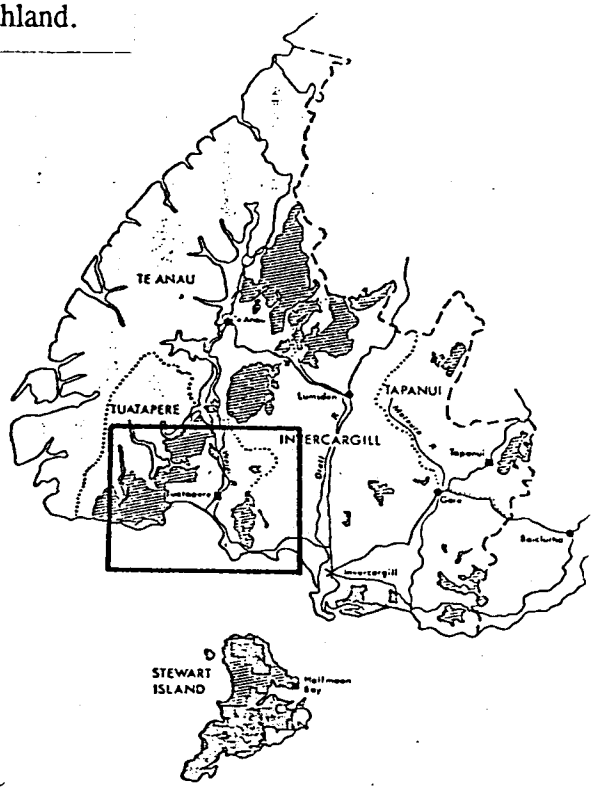
Although a point of debate by some whitebaiters, it is generally agreed that the whitebait runs, and the catch in general have greatly decreased over the last few decades, and are possibly still decreasing (from discussions with whitebaiters on Southland rivers). The exception to this is the West Coast which has suffered less habitat loss and still has large whitebait runs. While overfishing may be a factor in this decline, it is recognised that loss of habitat is the most important reason for this decline (McDowell 1991). This loss has occurred to both spawning and rearing areas and has generally taken the form of land clearance and development.

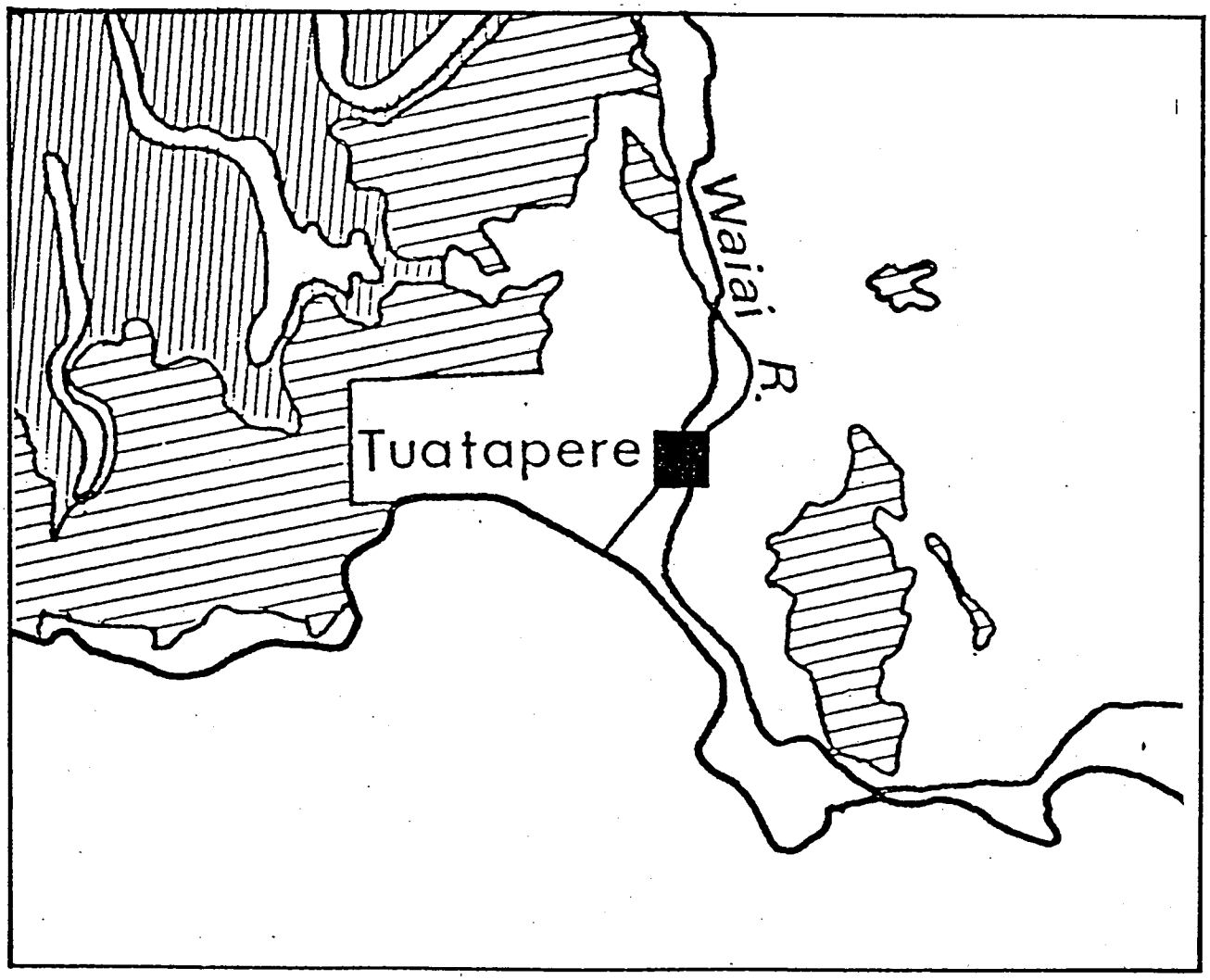
To help increase whitebait numbers both for the fishers and for the sake of the species involved it is important that habitat protection/restoration takes place. Rearing habitat can be enhanced relatively easily (in theory if not in practice) through fencing riparian strips, timing of drainage work etc. If suitable habitat is provided, the fish should use it.

Spawning areas appear to be defined by certain environmental criteria, including salinity, ie how far the salt water wedge intrudes up the river, bank contour, etc. (Mitchell and Eldon 1991). Many of these criteria are not well known or appear to be variable. This means that providing spawning areas is not simply a case of having the obvious physical features as one or more of the less known features may be missing, making the area unattractive for spawning. Inanga have been known to move their spawning site to a protected/enhanced area (Mitchell 1991). They are also known to spawn at far less desirable sites, including bare clay (T Eldon pers comm). These are presumably their historical spawning sites before habitat degradation took place. For this reason it is important to locate the spawning sites so that they can be protected and, if necessary, enhanced.

Locating spawning sites can be difficult, because even once the known required features are taken into account (e.g. salinity), there can still be quite large areas of suitable habitat to be surveyed and depending on the technique used this requires the input of resources over a period of several days.

FIGURE 1. Location of the Waiau River, Southland.





METHODOLOGY

The most common technique for locating spawning sites is to locate spawning fish during the spring tides in February - May (Mitchell and Eldon 1991). This was the main technique used in this study, together with searching likely sites for eggs after spawning should have occurred.

Locating spawning fish involves firstly locating inanga behaving like potential spawners, ie fish schooling up and "swimming with a purpose". These fish are then followed and watched until they (hopefully) spawn. The spawning itself is quite obvious with the fish moving into very shallow water with considerable splashing and, depending on the number of fish involved, the water turning milky with the males' milt.

Egg searches were also tried in likely areas where spawning fish were not able to be seen, this consists of getting down on hands and knees and searching at the bases of suitable vegetation. In areas of low water clarity, trapping with gee minnow traps was carried out to locate fish in spawning condition. This should help define likely areas for spawning by locating where gravid fish (fish containing eggs) were found. Traps were set at likely sites during the spawning period and baited with marmite, which has been shown to work well as a lure for native fish (Allibone and Chadderton 1992). This would not give the exact spawning site but should narrow down the area for further work, and give an indication of where general habitat protection should take place.

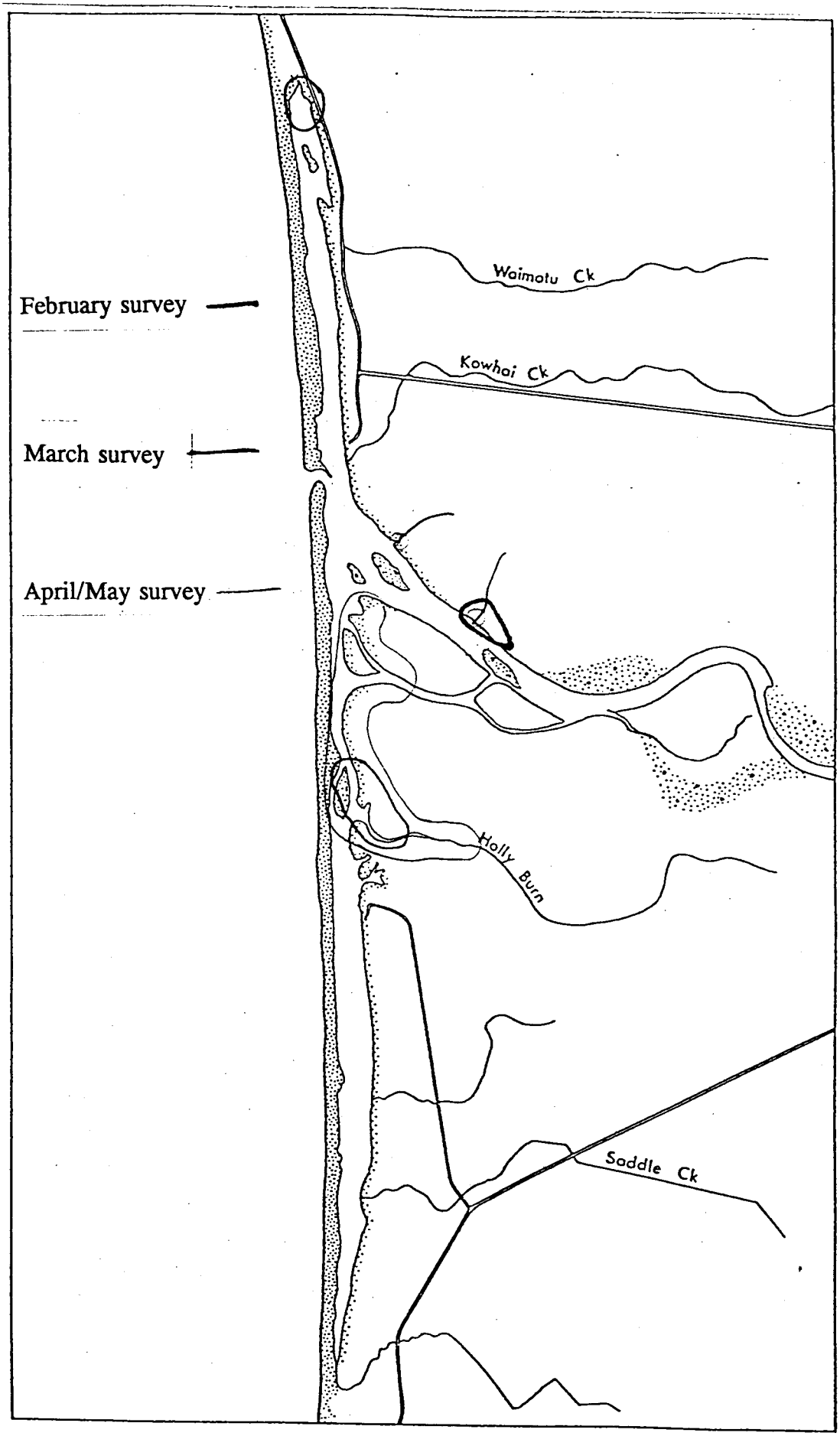
RESULTS

1. February Survey

The first survey in February located inanga spawning in a small unnamed stream approximately 1km up from the mouth on the true right of the main stream (fig 2). Approximately 500 inanga were observed for over 2 hours until they spawned in the vegetation approximately 20 metres up from the mouth of the stream, 45 minutes after the top of the tide. A visit 1 week later to check for eggs did not locate any. This is most likely due to a flood which had occurred in the intervening period. The flood had deposited quite a bit of silt over the area (approximately 10 mm of silt was left on the foot bridge which crosses the stream). Whether it was solely the flood which had such a detrimental impact on the eggs or the flood combined with the silt loading, is not known.

As spawning was confirmed at that site it was decided to put further resources into locating other sites hence it was not monitored again.

FIGURE 2. Location of areas surveyed for Inanga spawning, Waiau river.



2. March Survey

During the March survey adult inanga were located in moderate numbers at the western end of the lagoon (fig 2), but their behaviour was not that of spawning fish (i.e. they swam around aimlessly and showed no interest in going into the vegetation at the waters edge). At the eastern end of the lagoon only a few single fish were seen. Egg searches were carried out in the vicinity of the Holly burn and on the island just west of the Hollyburn's conflence with the estuary, but possibly due to the large extent of seemingly suitable habitat, these were unsuccessful.

3. April Survey

Following a discussion with Dr Charles Mitchell the April survey concentrated on an area in the eastern lagoon, namely the lower Hollyburn and the ponding areas just west thereof (fig 3). As there was often a difficulty in seeing fish in this part of the lagoon due to the murkier water, minnow traps were set for two nights during the spring tide to identify sites where the fish were and to see if the fish present were gravid.

The traps were set at likely sites in the eastern lagoon from the main river along to and including the Hollyburn. Most of the traps were set in backwaters and sidestreams along the northern edge (refer fig 3).

When retrieved the following day most of the traps had only single or no inanga in them. The exceptions were the traps set at a and b which held 5 and 11 respectively. Of these 12 were males and 4 gravid females. Site a was set in the channel which connects a lower tributary of the Hollyburn with a ponding area in the adjoining paddock. Site b was in a channel on the island which is largely covered by water during high spring tides. Both these areas had been checked for fish movement during the March spring tides and only single fish were seen then or during the April tides.

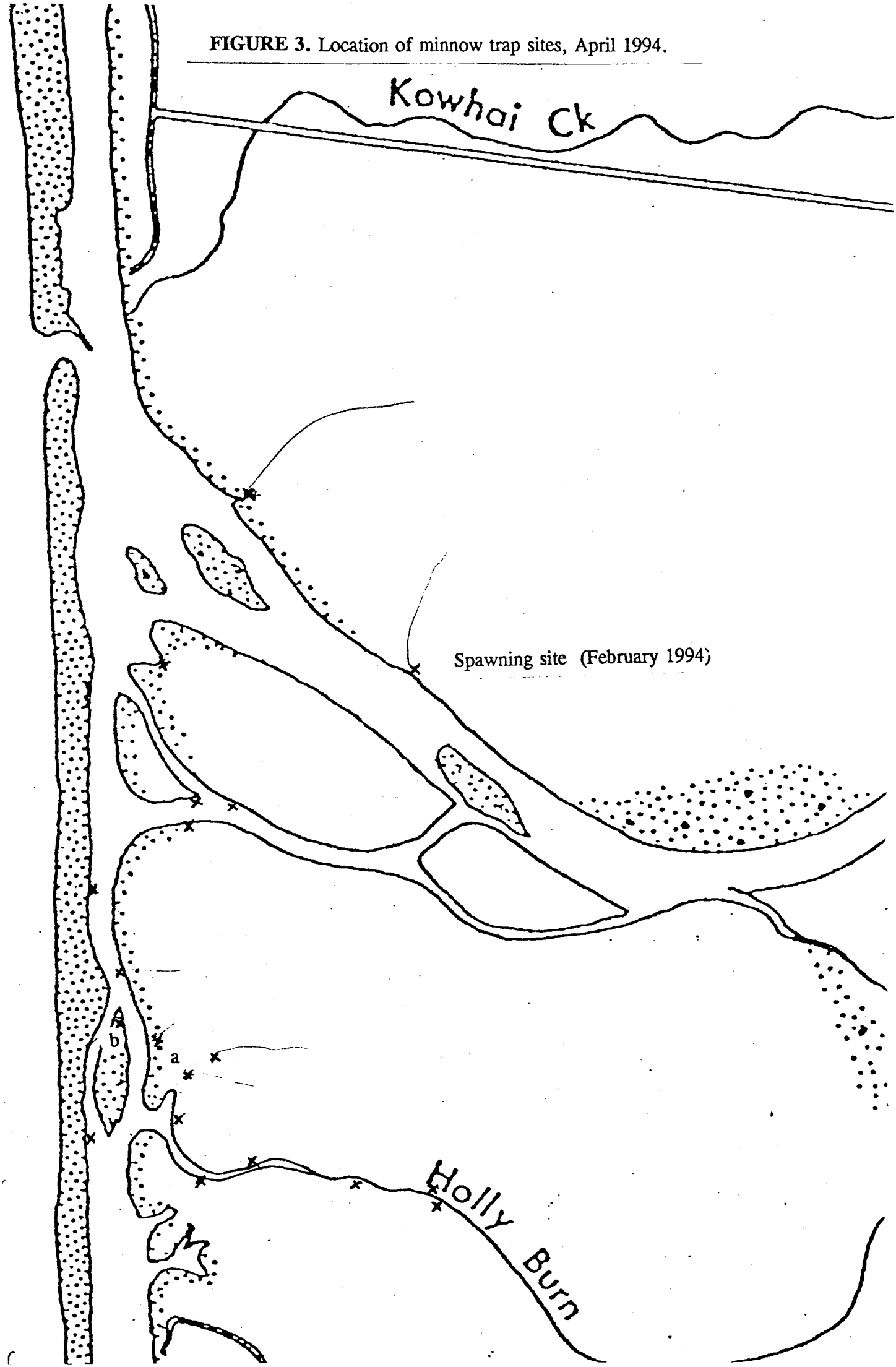
Traps were also set in the two streams on the true right of the main stream - neither of which caught any inanga. This was surprising as the upper of these two streams had good numbers of fish present further upstream in December 1993, and had spawning fish in February 1994.

Egg searches were again carried out in the area around the Hollyburn and the island in the estuary but were unsuccessful.

4. May Survey

The May survey once again concentrated on the sites identified as being the most likely during the April work. The river was high and discoloured, and this combined with rain made fish spotting difficult in any water over approximately 20 cm deep. This meant that there was little chance of locating fish in the main channel or in any of the deeper side streams to see if they were behaving like potential spawners. However if fish had been trying to spawn at what were deemed the likely sites located in April, they would have been observed. Since any spawning would have meant the fish would be going into the shallow water which floods the land on the sides of the streams. No inanga were seen at all during this survey, which is possibly attributable to most of the adult fish having spawned previously and died.

FIGURE 3. Location of minnow trap sites, April 1994.



DISCUSSION

Spawning in April may have been affected by the high water levels in the lagoon and lower reaches caused by the river mouth being closed for 10 days just prior to the spring tides. This flooded much of the low lying land around the lagoon including all of the likely spawning areas (fig 4). The question of what effect this may have on spawning (e.g. where would the fish spawn with their usual spawning grounds covered by water) would be better addressed to the native fish scientists.

The mouth blew on the 20th of April and the spring tides were on the 23rd to 25th. While the mouth was closed the water level rose approximately 3m above normal spring tide levels and covered all the likely normal spawning habitat.

Possible effects of the current water reime on inanga spawning.

1. Floods/Freshes

Floods may affect spawning by:

a) raising the water level at the time of spawning, above the usual spring tide level. This could affect the timing and/or place of spawning, including causing the fish to spawn at the top of the flood hence the eggs would not be covered by the next spring tide and would be wasted.

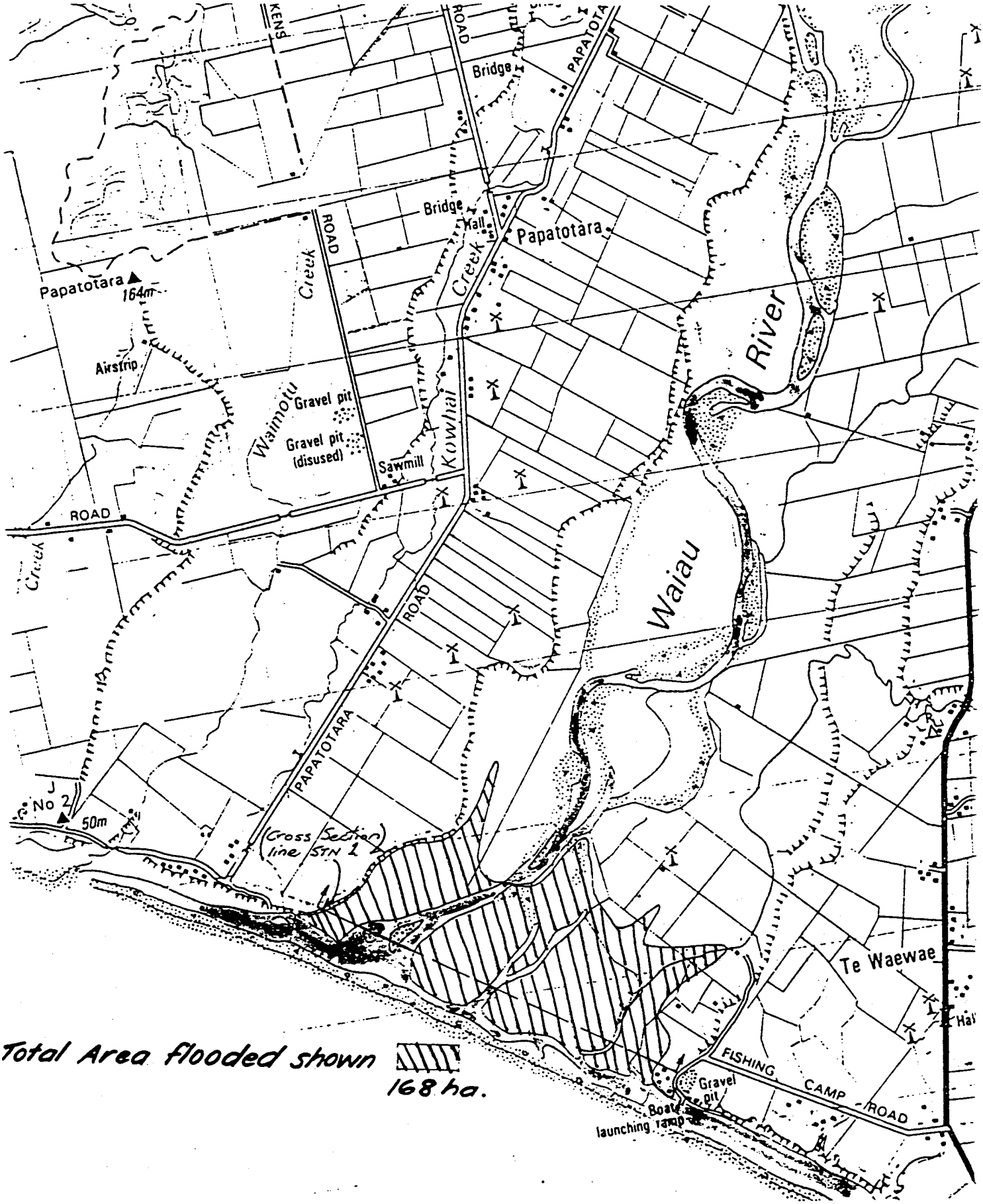
b) a flood may also wash away eggs after laying or if there is a high silt loading the eggs may be smothered.

The Mararoa Weir generally evens out the flows (currently at a greatly reduced level). This may be beneficial by making the tide the overriding influence on water levels in the spawning areas. But it also means that any releases of water have a greater percentage increase over normal river flows. As the Weir is generally only opened at times of high lake levels and/or dirty water coming down the Mararoa, the silt loading of the Mararoa water will probably be higher than when normally diluted with Manapouri water. This silt loading would lead to a greater risk of smothering the eggs as large amounts of silt can be dropped in the quieter backwaters which are frequently the spawning areas.

2. Mouth Blockage

If the mouth is blocked for any significant period prior to and during the spawning period it will affect the spawning sites, as the river rather than the tide becomes the main influence on water levels. Thus rather than the eggs being protected from predation by being laid at the peak of the spring tides, the water level either keeps rising making the eggs vulnerable to predation, or the mouth opens and the water level drops, leaving the eggs high and dry.

FIGURE 4. Area flooded during April 1994 mouth closure.



I am unaware of any research into the effect of constant or increasing water levels on inanga spawning (i.e. where would the fish spawn and what happens to their eggs if a) the level continues to rise and they are covered by water for several days or b) the mouth opens and the rapid drop in water leaves the eggs high and dry). Charles Mitchell or Bob McDowell could be requested to comment on this issue.

Mouth closures occurred prior to the power scheme being built. Hence we can only speculate as to the effect the current water regime in this respect. Nevertheless under the current flow regime with lower flows it takes longer for the river to build up sufficient water to break out. This increases the chances that the spawning grounds will be covered during the spawning period.

Suggested methods for protecting known and probable spawning sites.

The confirmed spawning site has two main threats:

1) Encroachment by willow trees.

2) Trampling by cattle.

A dense stand of grey willows currently growing along the spawning stream, upstream of the spawning site and along the neghbouring stream are rapidly encroaching on the spawning site They should be controlled before they cover the spawning site. While inanga may continue to spawn at the site if it is overgrown with willows, the habitat found under the trees is generally regarded as far less desirable (Mitchell 1994).

Control could either be carried out by spraying, by cutting the trees and poisoning the stumps or by injecting herbicide directly into the trees. These techniques will eliminate the willows without the risk of doing physical damage to the spawning site. It is important that work is timed to maximise the effectiveness of the chemical but minimise the potential risk to the spawning area ie not to kill the vegetation in the spawning area prior to the spawning season.

The area containing the spawning site is administered by the Department of Conservation and leased for grazing to Mr Erskine. The area is in rough pasture and is most suited for cattle. Cattle have ready access to the site with pugging and grazing of the semi aquatic vegetation in and around the spawning area having occured in the past. The area concerned is small and has little grazing value. Hence there should be little effect on the farmer by removing this area from grazing. This could be carried out by fencing the area and then planting flaxes which would help as a long term barrier and deter human access.

Sign posting the area to tell people of its values would be of doubtful benefit since at present the spawning site itself is not too close to the normal access way up the river. The greatest use of the area is by whitebaiters during August-November which is outside the spawning season. By signposting the area it is possible that people would be encouraged into the area. As most people are unaware of what they are looking for they could easily damage the site by trampling it.

Protection of the unconfirmed sites in the eastern lagoon.

Until the exact spawning sites are located any protection has to be general. Removal of the cattle from the area is the most important. Cattle currently have free access over most of the lower area including the lower Hollyburn and ajoining ponding areas. It would also be beneficial to ensure there is no encroachment by weed species, such as willows and gorse. Also no drainage work should be carried out.

Likely spawning areas should be taken into account if any habitat enhancement is to be carried out in this area.

Habitat enhancement.

As well as protecting the areas from any further degradation it would be beneficial if habitat enhancement work could be carried out. This could be both short term eg constructing ponding areas, and long term eg a planting programme useing native species with the aim of restoring the natural wetland/swamp forest ecosystem. While some of this work may be of minimal direct benefit to inanga spawning in the short term, it would provide a buffer area around the spawning sites. It would also enhance the area not only for inanga and other fish species but also for other birds/animals. Furthermore the aesthetic and intrinsic values of having a natural ecosystem would be significant.

Recommendations.

1. That willow control be undertaken near the known spawning site.

2. That cattle be excluded from the known, and likely spawning sites.

3. That habitat enhancement in the area adjoining the estuary take place.

4. That more survey work be carried out to locate further spawning sites.

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