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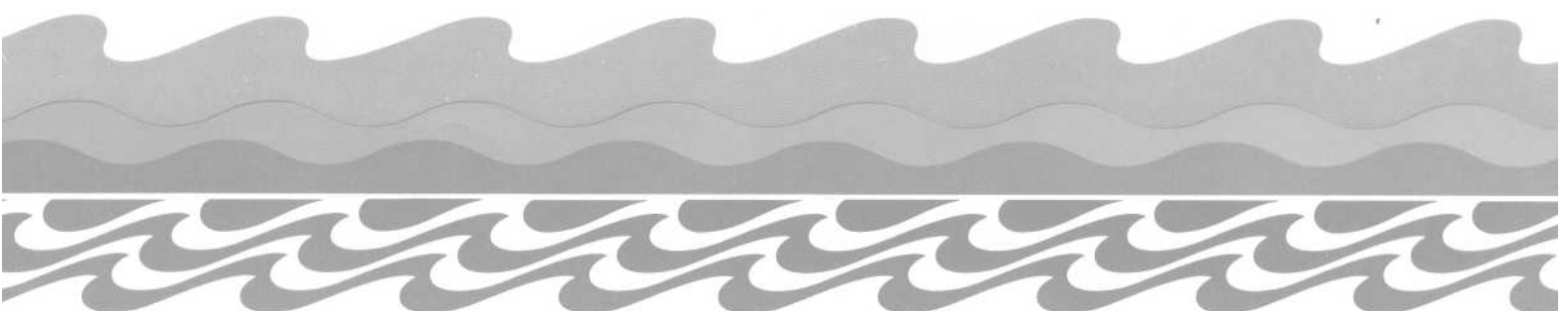
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PRELIMINARY PROTECTION OF WHITEBAIT (INANGA) SPAWNING AREAS IN HAWKES BAY

(Short Answers in Conservation Science)

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PRELIMINARY PROTECTION OF WHITEBAIT (INANGA) SPAWNING AREAS IN HAWKES BAY

H Rook, Department of Conservation, P O Box 644, Napier

INTRODUCTION

In 1987 the whole "whitebait (inanga) management scene" was transferred from various government departments and handed over to the new Department of Conservation (DOC).

Prior to 1987 and in the following three fishing seasons, local catches of whitebait in Hawkes Bay were at best described as abysmal. These local observations came as quite a shock, as I grew up spending a lot of time pursuing whitebait on Bay of Plenty rivers during the 1960's and early 1970's when catches were good. During 1989, Charles Mitchell (then Fisheries Research Division, Ministry of Agriculture & Fisheries) visited this Conservancy to look at our local rivers and was of the opinion that our local whitebait fishery was almost defunct. However, he felt that locating and protecting any remaining spawning habitats was well worth pursuing. He considered that grazing relief was most likely to foster conditions suited to spawning.

With these words of encouragement, a concerted effort was made to locate and protect these valuable sites and many hours of Departmental and my own private time went into this project.

It must be emphasised that it is not within the scope of this report to make technical statements, but merely to record and report on activities and my own observations.

Of historical interest are my own personal observations since the late 1970's on stock grazing patterns in Hawkes Bay. Today and back then, my leisure time activities centred around locating where pheasants lived, prior to the hunting period. Many hours were spent working bird dogs through some of the sites we have identified as whitebait spawning grounds today. I have noticed that pasture grazing does not occur now with the same intensity as it did up until 4 years ago. Stock numbers have dropped drastically throughout the whole district, and nationally, in comparison to what was the norm during the late 1970's and early 1980's when farming was subsidized.

2. METHODS

To date, the work has centred on northern Hawke's Bay, and has had as its focus to:

1. Identify whitebait spawning sites.
2. Fence these sites off to exclude stock as quickly as practicable.
3. Observe and record results.
4. Consider any methods that could be utilised to enhance spawning sites for inanga.
5. Encourage other DoC staff, both within the Hawkes Bay Conservancy and in other conservancies to undertake similar work in areas not covered.
6. Monitor the peak spring tides each month (1.8 +) looking for spawning activity. Determine when the best time could be to undertake any habitat enhancement work, whilst not destroying eggs.
7. To update and maintain liaison with the Hawke's Bay Regional Council staff, lessees of Council land, private landowners and whitebaiters.

3. CLIVE RIVER SPAWNING SITE (310 METRES) (FIGURE 1)

In 1991, 80 metres of spawning habitat was identified at this location.

As an experiment we built a fence (160 metres long) to exclude stock grazing, for the express purpose of determining if inanga would in fact utilise enlarged spawning habitat created by fencing. The fence was completed in the winter of 1992. It is most important to note that very little pasture grazing was lost by fencing work and in most cases only several metres back from the high tide level. No opposition has been experienced over any of these projects on private, crown or leasehold lands.

On the 1.8 metre spring tides in April and May 1993 spawning inanga were observed utilising our entire 160 metre fenced area.

During the winter months in 1993 our original 160 metre site was extended a further 65 metres downstream and 85 metres upstream. During the 1994 spawning periods it is proposed to monitor these sites and determine if inanga will again utilise these newly enlarged habitats. Recent discussion with a local resident leads me to believe that spawning took place approximately 400 metres upstream of our existing site, 2 years ago. Should spawning take place throughout the entire 310 metre fenced section, then we could confidently pursue extending fencelines upstream. We do not know the upper and lower limits of spawning. From a practical perspective the only way to determine this would be to extend fencelines and monitor spawning activity at these sites each season until the upper and lower limits of spawning activity are established.

Vegetation Control

In view of Charles Mitchell's comments on exotic vegetation encroachment, the control of silver poplar *Populus canadensis*, crack willow *Salix fragilis* and blackberry *Rubus fruticosus* has been undertaken to avoid smothering of desirable grasses utilised by inanga to deposit their eggs. This control work has been undertaken using the herbicide Ammate.

Favoured spawning vegetation - Clive River

Only two species of grasses have been used by inanga to deposit their eggs. Tall fescue *Festuca arundinacea* is commonly used, but creeping bent *Agrostis stolonifera* would appear to be preferable and is sought after by spawning inanga at this location. Creeping bent grows close to the mud. It forms a damp layer of stems that protect whitebait eggs from dessication.

4. TUTAEKURI RIVER SPAWNING SITE (100 METRES) (FIGURE 1)

Despite visits that coincided with spectacular spawning activity detected in the Clive River and Tukituki River systems during April and May 1993, very little inanga activity was

observed at the Tutaekuri River in 1993. During April an anchored oil absorbent boom was found below this site. This boom was heavily impregnated with oil and looked as if it had been anchored in the drain for some time (this equipment was removed in April 1993). It would appear oil pollution was the reason why inanga did not spawn here in 1993.

Further searches in the Tutaekuri River back water channel will be undertaken during the 1994 spawning runs, as it is suspected that other spawning sites may exist at this location.

Favoured spawning vegetation - Tutaekuri River

To date only two species of grasses have been used by inanga to deposit their eggs. Tall fescue is commonly used but creeping bent would appear to be preferred and sought after by spawning inanga at this location.

5. TUKITUKI RIVER SPAWNING SITES (200+ metres on true left bank, 300+ metres on true right bank) (FIGURE 1)

Tukituki River surveys during major spawning activity in April and May 1993 finally revealed exactly where these inanga spawn, which was a big thrill for me personally after all the unsuccessful surveys of past years in the Tukituki River system. Sheer bulk of inanga, eggs, milt and visual activity was a sight to behold. For those who have not witnessed this event then the best way to describe it is: "absolutely incredible".

Tukituki River - true left bank - Waipourea Road (200 metres)

This site is a fascinating one as it is located in an old drain that inundates low lying adjacent pasture during high tides.

Large numbers of ripe inanga were finally detected on 7 May 1993 by Mr Ross Ferguson of Clive and myself, coinciding with observations of inanga spawning on the true right bank.

On Saturday 8 May 1993 I returned to observe spawning over the whole 1.8 tide cycle, but had to abandon my search due to a rather aggravated and drunk waterfowl hunter who did

not appreciate my presence or dedicated search for spawning inanga. It was decided retreat was the best course of action here. Several days later this site was revisited but sadly, it had been grazed and trampled flat by dairy cows. Although no inanga were observed spawning, I strongly suspect this did occur here. Meetings between the lessee and Regional Council were held and permission to protect this site by fencing was enthusiastically approved by all concerned.

As the site was very wet, the Hawkes Bay Regional Council works division staff rammed all posts and strainers with a mechanical rammer. This fence was completed prior to Christmas 1993 and at the time of writing, vegetation is regenerating in time for our major spawning runs in Autumn of 1994. As this fence was built within the flood plain, powerpole augers have been used to hold strainers in position during flood conditions. Only 3 wires were used as the site is only grazed by dairy cows, while the fence would be less inclined to hold up flood debris in comparison to a 7 wire fence. Batten staples were used on posts so that debris is caught up, these will pull free. The staples become the weak link and pull out instead of wrecking the whole fence.

Of very special interest during recent months is the regular presence of two Australian Bittern feeding within our fenced off site.

Favoured spawning vegetation - Tukituki River

The Waipourea road site has dense beds of creeping bent and to a lesser extent tall fescue grass. Out of all sites fenced off for spawning purposes this site has by far the best vegetation. Monitoring of spawning activity and density of egg deposition will be observed with great interest from now on. If eggs are deposited throughout the creeping bent beds and up to the edge of this fence then it will be well worth approaching the Hawke's Bay Regional Council and lessees with regard to extending the fenced area?.

Tukituki River, true right bank, 300+ metres

Approximately 200 metres of fencing has been erected on Crown land administered by the Hawkes Bay Regional Council and a further 100 metres added to this fence, on private land

owned by Mr Dick Ken.

Prior to 1993 considerable time was spent looking for spawning areas 1000 metres upstream of where these spawning inanga were finally located. I certainly do not consider these unfruitful years as a waste of time because we definitely know where not to look now, and learned a lot in the process. This site was chosen to monitor the possible monthly spawning of inanga, which was first suggested by observations in October 1993.

TABLE 1. Recorded Spawning of Inanga - Tukituki River Hawkes Bay

Tide Height	Date	Month	Year	Comments
1.8	8-11	April	1993	Main run, large no's of big fish, ie. 120+mm
1.8	8,9,10	May	1993	Heavy spawning with large no's of smaller inanga 80+mm
1.8	16	Oct	1993	Moderate spawning, heavy milt stain present
1.8	15, 18	Nov	1993	Localised, light but enough to stain water milky
1.8	14,15,16	Dec	1993	Localised, light but enough to stain water milky
1.8	3,4,5	Jan	1994	Localised, light but enough to stain water milky
1.8	1	Feb	1994	Zero spawning detected, heavy 3m sea running. Inanga may have spawned higher up in system and were not detected
1.8	28	Feb	94	Zero spawning, heavy sea running
1.8	5	Mar	1994	Site checked but no spawning detected. High water levels may have pushed inanga up in system and were not detected
1.8	30,31	Mar	1994	No sign of spawning at this site or any other fenced spawning sites in Hawke's Bay
NB: It is interesting to note that no spawning has been observed on 1.9m tides. It appears all spawning stops and resumes on the 1.8's.				

Spawning activity detected outside the autumn period is very interesting. Are these migrations of inanga the survivors of past intensive grazing? Now that permanent spawning habitat has been provided, will these runs of inanga increase? Do inanga spawn during June, July, August, September and February?

Tukituki River - island at mouth of Grange Creek

Although inanga spawned above and below this island, no inanga were observed utilising this site. The vegetation originally consisted of mature gorse. In December 1993 this was felled with a powersaw and stumps swabbed with the herbicide Animate. It would appear that gorse has suppressed desirable spawning vegetation. If what I have done here works, so much the better. If it does not we have learned something and lost nothing.

Tukituki river - vertical bank edge - seaward side of the site

Recently the Hawkes Bay Regional Council works division contacted me with regard to proposed minor drain maintenance work on the bank opposite our spawning site. It was agreed to try creating habitat by cutting the bank back on a 15 ° angle from the 1.6 high tide level and up to 1.9. Some levelling will be required with a small digger to make it desirable for spawning purposes. This will be very interesting to monitor once desirable vegetation becomes established. If it works then we can physically create spawning habitat.

6. AHURIRI ESTUARY (FIGURE 2)

Only a brief field survey during spawning tides has taken place at this location, however I suspect this site is up the Taipo Creek (NZMS 260 V21 (409831)). Only small numbers of inanga were observed, however no stock grazing occurs at this specific site. Further field work/observations are required to obtain a clearer picture of what is occurring here.

Further up the Ahuriri Estuary spawning took place on Mr Holt's property (NZMS 260 V21 GR 401888) prior to the 1931 earthquake, but it has not been detected in recent times (pers. comm K Holt). Recent broad-brush field surveys have failed to detect spawning.

7. ESK RIVER (FIGURE 3)

This spawning site has been located, but no further work undertaken due to difficulty in retaining fencelines at this location. Refer to my previous report on this site. (Rook February 1991)

8. TE NGARU STREAM - TANGOIO (FIGURE 3)

This site has been located, however further work is required to determine exactly what the upper and lower limits of spawning activity really are (Rook, January 1994). The site is not presently grazed as the land is used for horticultural purposes. It would be interesting to follow up here with further observation work during the spawning tides of April and May 1994.

9. DISCUSSION AND RECOMMENDATIONS

A great deal of personal effort has been expended to learn more about our local whitebait fishery since 1987. This has resulted in a total of 1000 metres of spawning habitat identified, fenced off and protected from grazing during the critical 1-month periods when eggs are extremely vulnerable to destruction by stock grazing. Three further spawning sites have been located, but are not threatened by grazing at this stage. Circumstantial evidence (from my own observations and comments from fishermen themselves) indicate an improvement in our fishery has been detected during the last three seasons since spawning habitat has been fenced.

Generally whitebait spawn in small streams and drains. Where there is a large river they seem to migrate to small drains or streams close to the mouth. There they look for suitable spawning vegetation. If small streams and drains are not present, as for example in the Clive River, then inanga will utilise suitable vegetation on margins of the main river.

Presently it is "scientifically unproven" that inanga return to the waters in which they were born. I strongly suspect that they do, for if fish return haphazardly to any river system, we would have a variety of species recorded in local catches. Past research clearly demonstrates our local catch is virtually all inanga (*Galaxias maculatus*). It seems the only way we could test this theory would be by somehow marking whitebait eggs, then monitoring their return up rivers and in our whitebaiter's catch. Exactly how this could be done is beyond me, with eggs the size of a pin head! However, there is a possible DNA study topic here for a student.

To justify this spawning habitat protection work on the grounds the fish stocks will be improved may be impossible to prove scientifically. On our local rivers however, we are in a unique position, in that the fishery was virtually defunct before 1987 and was at best described as poor recreational.

Therefore, can we improve our local fishery by expanding spawning sites and carefully managing vegetation within them? Has the lack of survival of eggs on land been one of the major limiting factors here? Circumstantial evidence to date over the last three seasons tends to support this.

Whitebaiting has been very good over the past 3 years, average catches have risen from enough whitebait to make one patty per week, to catches of 2-3 pounds of whitebait over a single high tide cycle. One person caught 10 lbs of whitebait in one lift on the Clive River in 1992 season. Two, 10 lb lifts of whitebait occurred on the Ngaruroro River in 1993. One person caught 80 lbs of whitebait during the last week of our 1993 season in the Tukituki River. Catches such as these have not been reported on our local Hawke's Bay rivers for decades.

From a practical point of view our spawning habitat protection work is one of few options we have available to us for active whitebait management. We cannot undo past habitat destruction, but if fencing of inanga spawning areas results in further increases in whitebait numbers during coming seasons then some firm conclusions can be drawn.

If we are going to learn more about this species then we must continue protecting and monitoring spawning sites on our local rivers. We must also investigate the status of the adult population and its habitat requirements. More questions than answers exist with inanga as we continue this practical field work, but what we are doing now should give us some "positive indicators" and may be answers we have all been searching for.

Hawke's Bay Conservancy has 1000 metres of inanga spawning habitat identified and protected by fencing. Until recently I was unaware that we are the only conservancy in the country with as much habitat protected by fencing.

Another fact that I was also unaware of until recently was that inanga spawning during the months of October, November and December has never been officially observed or recorded in New Zealand before. (Pers comm C Mitchell). These spawning fish are an exciting find. When do their progeny return back up the rivers? Do they return 6 months later and outside the whitebait fishing season? Are they unharvested migrations of juvenile inanga? Are these the fish that local people speak of as migrating at odd times of the year i.e. Christmas, May etc? Will these specific populations increase now that we have provided a safe and permanent haven for them to return to for spawning purposes?

In view of these previously unrecorded spawning periods, it is imperative that we check the months of February, June, July, August and September 1994 for inanga spawning activity.

If we are to look at possible periodic stock grazing as a tool of habitat management when spawning sites become overgrown with vegetation, it is absolutely imperative that we know in what months inanga do and do not spawn.

It has been the experience on Bay of Plenty Rivers that after 5 years, dense beds of *Glyceria maxima* exclude inanga from penetrating through this vegetation and into desirable spawning habitat. (Pers comm. C Mitchell). This plant does not occur in Hawke's Bay waters, therefore our situation may well be different to that of the Bay of Plenty.

My prime objective when work started on locating and protecting spawning sites, was to at least halt the decline of our local whitebait fishery, or at best, attempt to enhance it by protecting and looking after habitat requirements of these special fish.

The Department of Conservation has the functional responsibility for the conservation of fresh water fish. It is my personal belief that habitat protection of our fishery is the key to inanga conservation and sustained long term management. The Hawke's Bay Conservancy has most certainly taken up this challenge and gathered a great deal of additional knowledge previously unknown on inanga.

I accept that while a great deal of this work has not been quantified in a technical sense, it must also be accepted that when we started in 1987, there was not really a great deal we could quantify in so far as catch data was concerned anyway.

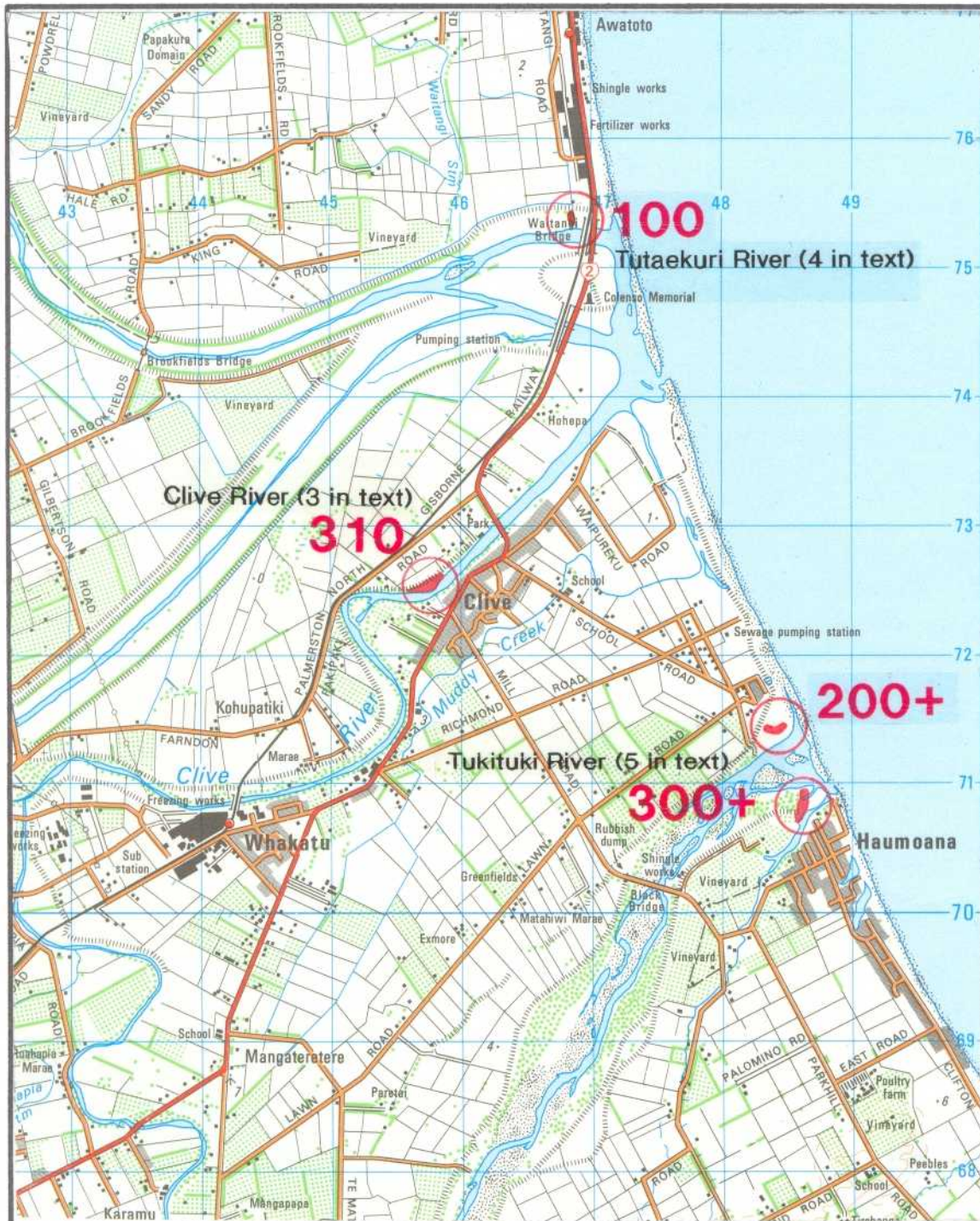
The whole project has created a great deal of positive public relations and support for the Department locally from folk who have not been even remotely involved with this work. This job then is clearly "a bread and butter project" that all of us can hang our hats on locally.

10. ACKNOWLEDGEMENTS

It is fitting that I acknowledge the magnificent help I have received from the Hawke's Bay Regional Council particularly Mike Healy's works group staff. I would like to thank the Hastings periodic detention group who have been involved in fence building. There has also been considerable assistance and co-operation from a large number of whitebaiters who have passed on invaluable pieces of information and "local knowledge". Without the help of all these people very little would have been achieved. To all these folk, I owe a lot. A very special thank you must go to Charles Mitchell for his encouragement and enthusiasm for this project. It must be a real pleasure for him to see Department of Conservation staff pursuing the whitebait management work that he has been advocating for a long time. Lastly, but certainly not least I wish to thank Field Centre Manager Mr Ken Hunt for his back up, support and patience, for without these attributes I could not have obtained the results obtained so far.

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**Locations of Spawning Sites
with their length in metres
FIGURE 1**

HAWKE'S BAY LAND DISTRICT

LOCAL AUTHORITY: Hastings District & Napier City

SCALE 1 : 50 000

PREPARED BY
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REFERENCES :
INFOMAP 260 V21

