INLAND FISHERIES COMMISSION
NEWSLETTER
VOLUME 21 NUMBER 2 – OCTOBER 1992

Casting at Corra Linn

Corra Linn is owned by the Inland Fisheries Commission and was established for use as a trout hatchery. With the gradual reduction in numbers of fry released through the 60's the site proved unsatisfactory as elevated summer water temperatures from the North Esk River were unsuitable for rearing fingerlings. It is a peaceful, picturesque area with well kept lawns and a frontage on the North Esk River and is used extensively during summer days and evenings as a picnic area.

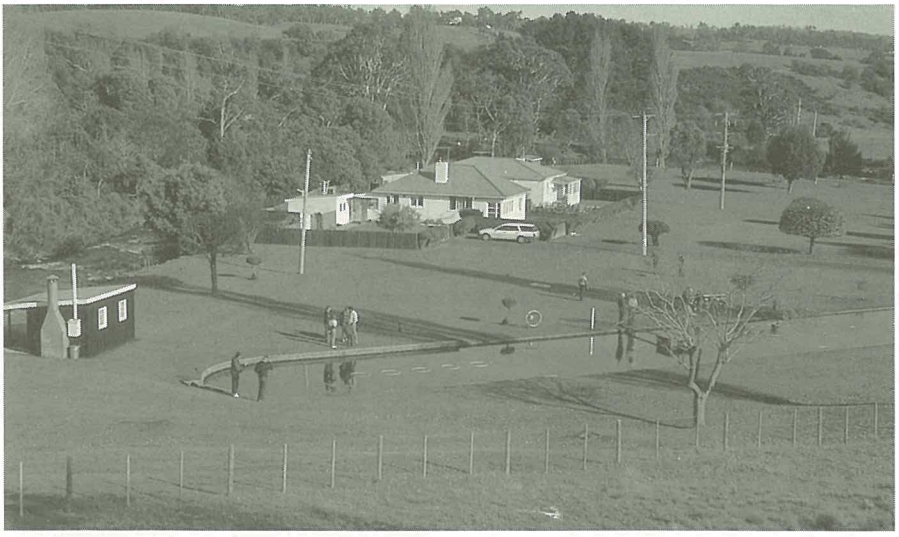
In the mid 1960's Corra Linn was known as the "C O Holmes Fish Culture Park" in appreciation of the effort and vision of the late Mr C O Holmes a former Commissioner of the Salmon and Freshwater Fisheries Commission, the forerunner of the present IFC. The name was never registered and the name Corra Linn has been used since then and is now recognised by the Nomenclature Board.

Competitive casting has now returned to the Long Pond at Corra Linn with the successful staging by the Corralinn Casting and Fishing Association (CCFA) of its first club championship on 31 May 1992.

Back in 1955 an Australian championship was held at this venue but the previous club folded in the late 1950's. Several Tasmanians had reached the high standard necessary for interstate competition, with Ken Littlejohn and Terry Charlton both being Australian champions in their chosen disciplines.

The newly formed CCFA holds monthly meetings which consist of a short formal session followed by items of general interest such as discussions on different gear, knots, fly tying, videos etc. Casting is conducted every alternate Sunday from 9am at Corra Linn.

The long pond – Corra Linn



The CCFA is not only about competitive casting but also provides tuition and assistance to those in need. It is a venue where coaching can be provided, problems corrected and tackle assessed and adjusted if necessary. The overall aim is to make anglers more proficient at their sport thus increasing their enjoyment.

Everyone is welcome. For more information contact (003) 976323, (003) 311179 or (003) 931144.

Norm Scott, President
Corralinn Casting and Fishing Association.

CONTENTS

IN BRIEF

1992 Tasmanian trout fishing championships

The 8th annual championships will again feature a return trip for two to New Zealand's Lake Taupo as the major prize. The trip includes air fares, accommodation, hire car and boat, evening meals and guiding services. But, this is only one of a long list of prizes on offer.

The championships will be held on 31 October and 1 November 1992 and entry fees are $5 adult and $2 juveniles under 17 years. There is also a team category at $50. Fish may be caught from any water in the State with the weigh-in at the Great Lake Hotel. Any fish weighed in becomes eligible for the major prizes.

Lake Sorell angling diary appeal

The Commission is seeking diaries from Lake Sorell anglers who have kept detailed long-term records of angling activities since the early 1980's. This information is required to study fishing effort and habits at Lake Sorell. Ideally, the diaries should contain details of daily catch numbers, hours fished and weather conditions.

If you can assist, please contact Stuart Chilcott, Inland Fisheries Commission, 127 Davey Street, Hobart 7000. Telephone (002) 23 6622.

WHA management plan

The Tasmanian Wilderness World Heritage Area Management Plan 1992 was recently approved by the Governor and took effect on 14 September 1992. It is intended that the plan be reviewed in five years time. Copies of the plan are available from the Department of Parks, Wildlife and Heritage for $12.

It is now appropriate for the IFC to review management of trout fisheries within the WHA in line with any constraints that may be imposed by the plan. The recently prepared Sloane/French report will serve as a guide for this review but is not the final word. Should any major issues arise during this review they will of course be referred to anglers for discussion.

Lake Sorell study commenced

In the last Newsletter Lake Sorell was identified as being vulnerable to eutrophication. In reviewing our knowledge of this water it was soon apparent that there was little detailed knowledge of exactly what was driving this very productive fishery. It was therefore decided to commence a study to answer a few questions about this water and nearby Lake Crescent.

What is known?

- Five years data on plankton and water quality from 20 years ago;
- one years plankton/nutrient relationships from 1991-92;
- 20 years data on lake levels;
- lake morphology data;
- 14 years data on length, weight, age and sex of fish from the Mountain Creek spawning run;
- creel interview data for two years;
- angler questionnaire data for seven years.

Analysis of the spawning run data suggests that recruitment problems can be related to seasonal factors and that they may be predictable.

What is proposed?

The proposal is to fill some of the gaps in knowledge:

- obtain better data on the physical and chemical nature of the lake;
- obtain details on trout feeding preferences in the lake;
- further examine catch returns;
- intensively study the spawning run and mark fish for total population estimates;
- study recruitment to the lake from Mountain Creek.

The final objectives of the project are as follows:

- provide an update on water quality in the lake and its relationship to storm events;
- provide detailed information on the plankton communities;
- provide an accurate description of the spawning run at Mountain Creek and a confirmation of the relationship between redd dewatering and rainfall;
- provide a detailed picture of the fishery-catch rates by method, fish diet and seasonal changes, effect of poor water quality from turbidity events on catch rates;
- provide estimates of the population size and mortality of fish in the lake and the relative contribution of angling to overall mortality;
- provide an assessment of lake levels likely to affect the marshes.

This is but a brief introduction to the project and no doubt further update will appear as it proceeds. Angler input has already been requested for gut samples and you may be questioned from time to time at the lake. In the meantime, contact Peter Davies or Stuart Chilcott should you require further information.

Rainbow from '92 spawning run in Lagoon of Islands

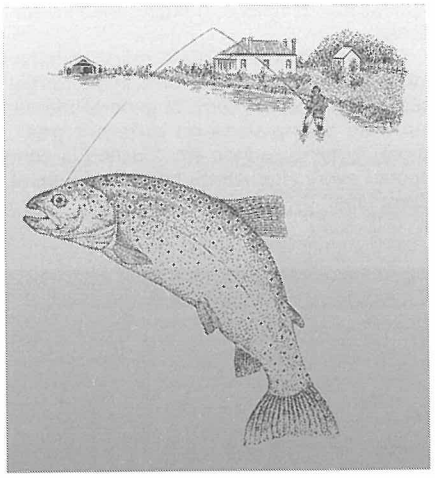
Lagoon of Islands spawning run '92

Brown trout and rainbow trout in spawning runs in Lagoon of Islands were recently measured and weighed with the following results:

	Brown	Rainbow
Range of weight (g)	550-3 200	1 650-3 300
Average weight (g)	2 259	2 417
Range of length (mm)	343-618	470-600
Average length (mm)	557	541

The size and condition of these fish suggest that the lagoon would be well worth a visit this season.

Australian Museum of Trout Fishing



In the last Newsletter we indicated our intention to develop a museum at the Salmon Ponds some time in the future. It is now very pleasing to be able to say that this museum will become a reality in early 1994.

This follows the State Government's announcement that they will provide $80 000 in this year's budget for the project with further support next financial year. A sum of $11 500 has also been allocated by the Department of Parks, Wildlife and Heritage towards the cost of a Conservation Plan for the Salmon Ponds site.

A contract for the Conservation Plan has recently been let. The purpose of this work is to provide an overall framework to guide future developments of the Salmon Ponds site. This must take account of the National Trust classification of the site and should consider all likely future uses including the museum proposal, fish production aspects, visitor access and use etc.

An informal committee has been formed to guide the development process. This consists of angler and Government representatives. However, it is expected that in the longer term the general management of the museum will be guided by a more formal group of angler (statewide) and Inland Fisheries Commission representatives.

The present group is:

Wayne Fulton	Commissioner, IFC
Kevin Lange	Hatchery Manager, IFC
Kevin Petterwood	Secretary, IFC
Martin Davies	Archaeologist PWH
Harvey Taylor	Hon. Historian, STLAA
Trevor Sutton	Tas Television

In the meantime the Commission is beginning to formulate ideas for the museum displays. There is a tremendous scope for these displays and we do not wish to limit them to Tasmania alone. Displays will have a national orientation and will feature the history and development of trout fishing in all parts of Australia.

In broad terms, the general themes for display will include:

- the history of salmonid introductions
  - to Tasmania
  - elsewhere in Australia;
- the history of Salmon Ponds
  - other hatcheries;
- specific Australian fisheries, eg
  - Shannon Rise
  - Great Lake/Lake Pedder
  - Snowy Mountains;
- fishing gear development
  - rods/reels/lures etc
  - development sequences
  - Australian gear/makers.

Special identities will be featured within each of these categories so if anyone has any information, photographs, diaries, equipment, memorabilia etc that they no longer require or are prepared to loan, sell or donate, we would be pleased to hear from you. The museum is eligible in terms of the Taxation Incentives for the Arts Scheme and therefore any donations of equipment or money are tax deductible. We are also prepared to buy equipment or accept any material on loan for which we would acknowledge the owner in any display.

There is a great deal of work to do even though the opening date is still some 15 months away. The Commission intends to assemble a top quality exhibition and one that trout fishers all over Australia can be proud of. Your support would be appreciated and do not hesitate to contact us should you require any further information at all.

THE COMMON MUD-EYE (Hemicordulia tau)

by Stuart Chilcott, Scientific Officer, Inland Fisheries Commission

There are several fishing waters that anglers flock to religiously at certain months of the year – the reason, 'the mudeyes are on'! Flyfishers, are noted for their rapid response to a mayfly hatch, but emergences of some species of mudeyes have a universal appeal for anglers using all methods.

'Mudeye' is the common name for the larval stage of several species of common dragonflies and probably refers to the cryptic, bottom dwelling habit characteristic of the larvae. From the scientific Order: Odonata and the Family: Corduliidae, *Hemicordulia tau* is the species responsible for the prolific mudeye hatches observed around many lake shores in southeastern Australia. The larval migrations that immediately precede the hatches are the factor that makes them particularly vulnerable to predation by trout and consequently of great interest to anglers.

Life cycle

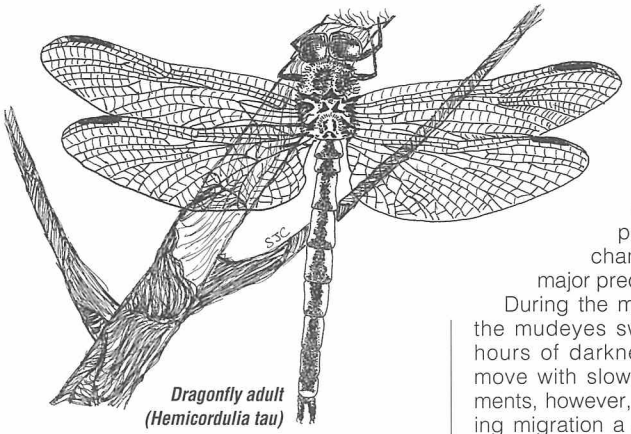
The eggs of dragonflies are usually laid by a flying female skimming across the water surface and dipping her abdomen onto the water. Numerous dippings are undertaken on each egg-laying flight with a batch of eggs laid with every dip of the abdomen. Various reports have recorded that dragonflies will mistakenly attempt to lay eggs on any surfaces, eg car roofs or road surfaces, that shimmer in the sun and resemble a water surface.

The time taken for egg and larval development is dependent on water temperature with high temperatures resulting in short development times. It has been shown that egg development can be as short as six days and larval development 36 days at water temperatures of nearly 30°C, whilst these periods are progressively longer at lower temperatures (Hodgkin and Watson 1958). In warmer areas there could therefore be two major hatchings in a year.

The number of instars or moults experienced by the larva is also dependent on the environmental temperature, with the larvae of *H tau* reported to undergo nine larval instars over a period of 12 months at Lake Eucumbene (Faragher 1980).

Individuals of populations in a lake will usually emerge to undertake egg-laying over a several week period during the summer. Adults may fly far from the larval habitat usually patrolling open spaces amongst vegetation. The adult life span is mainly determined by air temperature and may vary from two to several weeks. Once the adults mature the female mates with one or several males and lays a batch of eggs. The female may continue to mate and lay more eggs until exhaustion, wing wear, food shortages or unfavourable air temperatures result in death.

Adult dragonflies are adept fliers, often remaining in flight for long periods. Large flocks, composed of individuals making swift darting flights can often be observed. The adults are carnivorous and hunt flying insects such as mayflies and mosquitoes by sight.



Dragonfly adult (Hemicordulia tau)

Larvae

The larvae or mudeye is coloured various shades of brown although often the pattern is obscured by detritus and other debris. The shape of this species is stout and squat with long slender legs which are sparsely covered by fine hairs. The wing pads of larva nearing emergence are parallel to each other, whilst the rounded body is approximately 2cm long in the final instar.

Adults

The robust adults of *H tau* are generally black or metallic on the back and bright or dull yellow green underneath. The pattern on the abdomen is an important characteristic for field identification. Positioned between the large eyes on the front of the head is an obvious black pattern similar to an inverted 'T'. The adults are approximately 5cm long with a wing span of 7cm. When resting the wings are spread horizontally like most other Tasmanian dragonflies.

Distribution

H tau is found in all the major geographical regions of Australia in habitats ranging from permanent high altitude rivers and lakes to temporary streams and desert pools. The adaptability of the larvae allows for survival in habitats which are subjected to environmental extremes unsuitable for many other aquatic animals.

The adults are strong fliers capable of flying long distances from larval habitats. Migrations of 500 km or more are suspected by adults dispersing from Queensland to New South Wales (J. Hawking, pers. comm.).

Ecology

In Tasmania, *H tau* is an early coloniser of new impoundments eg Lake Pedder, Brushy Lagoon, and rapidly establishes large populations. Abundance appears to decline as the impoundment ages, however, no research has been undertaken to confirm this observation. Such declines may be related to increased competition from other dragonflies, changes to habitats such as an increase in eroded shorelines or reduction in preferred food supply or changes in the abundances of major predators such as fish.

During the mid to late summer months, the mudeyes swim shoreward during the hours of darkness. Generally, the larvae move with slow deliberate walking movements, however, upon disturbance and during migration a system of jet propulsion is utilised. Water is expelled through the rectum forcing the larvae forward in a series of short pulses – a movement pattern that can be imitated by anglers' lures. At these times larvae are particularly susceptible to predation by trout. The larvae climb onto emergent vegetation, dead trees or rocks and begin metamorphosis which results in the emergence of the familiar adult dragonfly. The newly emerged adult then positions itself in the sun to raise its body temperature and to harden the wings.

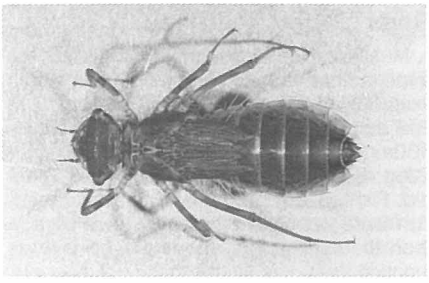
A comprehensive study of the diet of rainbow trout and brown trout in Lake Eucumbene showed that larvae of *H tau* was an important food item. The average percentage of *H tau* by volume in the diet of rainbow trout and brown trout was 10.0% and 12.4% respectively, over the six years of the study. Presence in the diet predictably attained a maximum level during times of larval emergence and adult egg-laying. These results indicate that both species of trout prey selectively on late larval stages which possess a head width of at least 3mm although at most times there is a smaller size range available (Faragher 1980).

References

Hodgkin, E. P. and Watson, J. A. L. (1958) Breeding of dragonflies in temporary waters. *Nature,* **181,** 1015-1016.

Faragher, R. A. (1980) Life cycle of *Hemicordulia tau* Selys (Odonata: Corduliidae) in Lake Eucumbene, N.S.W., with notes on predation on it by two trout species. *J. Aust. ent. Soc.*, **19,** 269-276.

Dragonfly larvae



Food of trout in the Macquarie River

Mary Mulcahy, Technical Officer, Inland Fisheries Commission

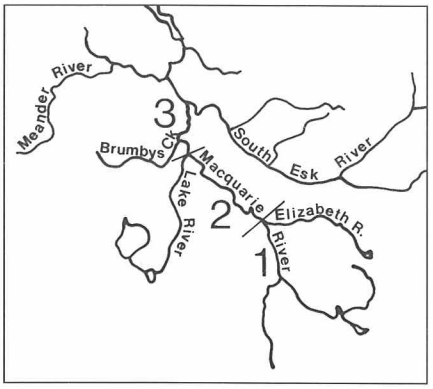
As part of the Macquarie River study reported in the last newsletter, anglers have been collecting trout guts for the past three seasons primarily to find out to what extent the fish fed on the mayfly swarms that are a feature of the river. The anglers also measured, weighed and collected scale samples from the fish they caught so as to gain some idea of the ages and growth rates of the fish.

Methods

At the end of each fishing season the guts were collected from the anglers and dissected. The contents of the guts were then ranked from lowest to highest in terms of percentage volume (the relative contribution of each food item to the total volume of food in the gut) and frequency of occurrence (the proportion of guts containing a particular item).

As the catch was spread over the whole river the gut analysis has been presented in three reaches:

Reach 1 above the Elizabeth River junction;
Reach 2 above the Lake River junction to Elizabeth River junction;
Reach 3 below the Lake River junction.



Study reaches in the Macquarie River

There are several biases with the data collected from the fish guts. Firstly, although the anglers were given permits to collect undersized fish none were caught, so the diets are biased toward adult fish (or fish > 220mm). Secondly, the data is only from months when the fishing season is open so there is no information about what the fish are eating during winter months. Also, most anglers that fish the Macquarie do so to coincide with mayfly hatches and there were few fish caught in months when these hatches did not occur. Nevertheless, the results do show some changes in diet that may be of interest.

Ages of fish in the Macquarie River

Most of the fish caught by anglers were three to four year old fish ranging in length from 295 to 370mm and weighing between 255 and 600g. The longest fish caught was 490mm and the heaviest fish weighed 1 220g. Both these fish were over five years old. Fish caught below the Lake River junction were consistently smaller for their age than the fish caught above the Lake River junction.

What are the fish eating?

When the top ten dietary items are ranked from highest to lowest in terms of % volume and frequency of occurrence, the five highest ranked items are the same. Caddis larvae, red spinner adults, beetles, dragonfly adults and snails are the most frequently eaten items and also contribute the greatest volume (70% of the total volume) to the diet of the fish

Only two items are not common to both rankings. The water bugs are ranked 17th in terms of percentage volume but occur in 12% of the guts (rank 9); ie water bugs are not eaten in large amounts but are eaten frequently. Crayfish occur in only 7% of the trout guts (rank 13) but rank as the 6th most important food item in terms of percentage volume. Crayfish are not eaten by many fish but when they are eaten they are eaten in large numbers or a few large crayfish are eaten. The particular points that stand out in the dietary study are described further below.

Comparison of diets between reaches

If the diets of the trout between reaches are compared, (Table 1) irrespective of the time of year they were caught, beetles, snails and flies were most important to the diets of the fish above the Elizabeth River junction (Reach 1). Above the Lake River junction (Reach 2) the fish ate mainly beetles and red spinner adults but they also consumed many snails, flies and dragonflies. By contrast, below the Lake River junction the fish ate mainly caddis fly larvae and dragonflies, with beetles, snails and red spinner adults being less important.

Food Item	% Volume		
	Reach 1	Reach 2	Reach 3
Beetles	33	45	16
Snails	15	11	8
Frogs	7	1	0
Flies	7	1	0
Caddis (larvae)	7	5	34
Red Spinner (adults)	6	24	6
Red Spinner (nymphs)	5	0	1
Dragonflies	5	6	19
Spiders	2	2	0
Crayfish	0	0	3
Unidentified	13	5	13

Table 1: Contribution of various items to diet in the Macquarie River

Seasonal diet

If the diets of the trout are compared for different months of the year (see table 2) irrespective of the reach in which fish were caught, caddis fly larvae were important in summer months and in early Autumn (December to April) and became increasingly important in the months leading up to summer (October and November). Beetles were most important during August and September and were replaced in importance by red spinner adults in October. The red spinner adults contributed more to the diets during October and November and less in September, December and March. This coincides with anecdotal information about the timing of mayfly hatches.

It is interesting that very few red spinner duns or nymphs are found in the guts considering that for duns, at least, the fish have been observed feeding on them on the water's surface. Very few black spinner adults, duns or nymphs were found in any of the trout guts from the Macquarie River.

Diet and fish size

Although there were no undersized fish collected, diet did vary with the size of the fish to some extent. For example, the contribution of dragonflies to the diet increased with increasing size of fish whereas the contribution of red spinner adults to the diet decreased in the larger fish. This may mean that small fish are less physically able to take large dragonflies and that it is not efficient for large fish to eat many small items such as red spinner adults compared with eating a few large dragonflies.

Origin of the food items

By looking at where some of the most important food items come from in the river, some predictions about what is important to the trout food and therefore the trout fishery can be made:

- Beetles are blown from overhanging trees, bushes or grasses at the edge of the river on to the water's surface where they are eaten. This is also true for grasshoppers, ants, crickets and many other items taken by the fish.
- Mayfly adults are taken on or just above the water surface, where they hover in swarms for mating purposes, or in hatches around reeds where the duns have crawled to emerge.
- Dragonflies are taken by fish at or just above the water surface, generally near reeds or water plants, where they emerge, mate and lay their eggs.
- Caddis fly larvae are found near reed beds with many making their cases from reeds, sticks or other pieces of plant that fall into the water.

Therefore, plants at the waters edge and plants growing in the water provide homes and refuges to many of the animals that the trout eat and are therefore important to the trout fishery in the Macquarie River.

Conclusions for the angler

- Black spinner adults, duns or nymphs do not contribute significantly to the diets of trout in the Macquarie River.
- Red spinner duns and nymphs do not contribute significantly to the diets of trout in the Macquarie River.
- Red spinner adults are the most important dietary item taken by trout in October and November and contribute significantly to the diets in September, December and March.
- Prior to the hatches of red spinner adults, beetles are the most important dietary item.
- Following the hatches, caddis larvae contribute most to the diets of the fish gradually increasing over the summer from October to February and decreasing as winter approaches.
- The availability of food items changes with the section of river in which the fish were caught and to a certain extent with fish size.

Food Item	% Volume					
	Aug	Sep	Oct	Nov	Dec	Feb	Mar	Apr
Beetles	46	48	25	12	8	3	9	10
Snails	25	17	10	9	8	0	2	22
Frogs	11	4	1	0	0	0	0	0
Caddis (larvae)	3	3	16	14	39	56	36	31
Crickets	0	0	0	0	0	0	0	6
Red Spinner (adults)	0	20	32	33	9	1	8	4
Red Spinner (nymphs)	0	0	1	0	0	0	2	2
Dragonflies	1	0	4	11	11	30	36	0
Spiders	1	5	1	1	1	0	1	3
Crayfish	0	0	1	3	2	3	2	5
Unidentified	2	2	7	12	22	7	3	17

Table 2: Seasonal diet of trout in the Macquarie River

By studying the diet variations along with the notes on where the items are most commonly found in the stream, anglers **may** just add a fish or two to their bags. In any case, it will be fun trying.

Acknowledgments

I would like to thank the The Fly-Fishers' Club of Tasmania and the anglers who collected the guts for this work especially: A Ritchie, R Trotter, R Costello, R Klimeck, J McKean, J Spencer, C Dolby, W Brooks, C Oliver, J Morwood, T Hardy and M Hardy.

TROUT SURVEY

Lake Mackintosh and Lake Rosebery

Bill Thompson, Technical Officer, Inland Fisheries Commission

Lake Mackintosh was first flooded during 1980 and Lake Rosebery in 1983. Both waters have received only minimal stocking in the past due to the abundance of spawning creeks available. Lake Mackintosh was originally stocked with 100 000 brown trout fry in 1980 and has received the occasional rainbow trout stockings; 10 000 fry in 1980, 13 000 fingerlings in 1986 and 3 000 fingerlings in 1989. Lake Rosebery has only had the one stocking of 14 600 rainbow fingerlings in 1991.

During January 1992 both Lake Mackintosh and Lake Rosebery were surveyed in order to assess fish numbers, growth rates and the size and condition of the trout available to the angler.

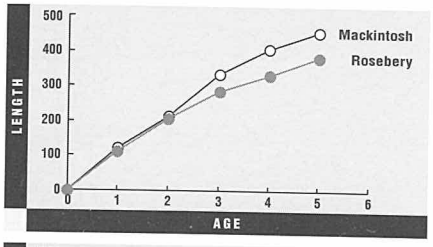
Survey Results

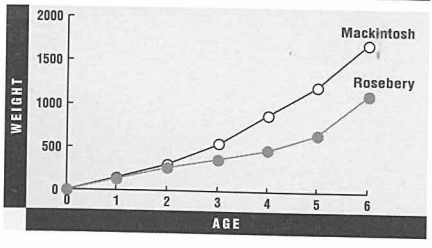
Both Lake Mackintosh and Lake Rosebery were test netted over two nights. Details of catch, length and weight information, as well as scale samples for age determination, were collected. The results of the survey are listed in the table 1.

Lake Mackintosh produced the largest fish of 2 050g with an average of 835g for brown trout and 1 031g for rainbow trout. Lake Rosebery on the other hand supports a population of smaller brown trout only, averaging 426g whilst the rainbow trout in this water averaged 231g.

Growth

Scale samples were examined to determine age and previous growth information.

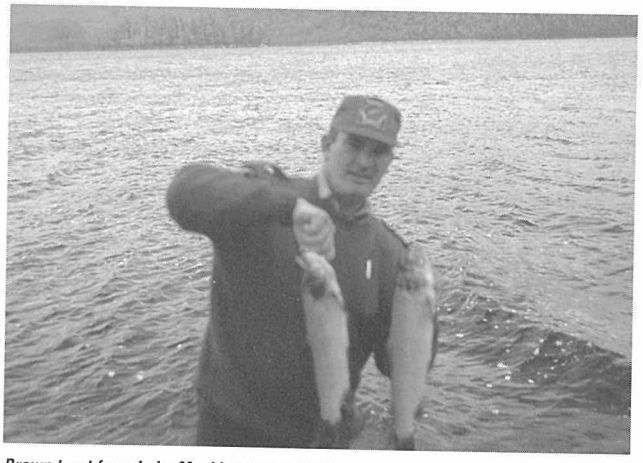




These show that the growth rates for both waters are similar for the first two years after which the fish in Lake Mackintosh grow at a faster rate than those in Lake Rosebery.

During the netting survey several large spotted galaxias *(Galaxias truttaceus)* were collected in the nets in Lake Mackintosh. No galaxias were collected in Lake Rosebery. It may be that once fish reach a certain size (2+ years) in Lake Mackintosh they are taking advantage of the forage fish available and therefore are continuing to grow well.

	No.	Av Wt (g)	Range (g)	Av L (mm)	Range (mm)
Lake Mackintosh					
Brown	47	835	150 - 2 050	407	235 - 593
Rainbow	4	1 031	650 -1 550	441	372 - 512
Lake Rosebery					
Brown	37	426	200 - 1 250	318	243 - 475
Rainbow	4	231	200 - 250	254	238 - 275



Brown trout from Lake Mackintosh (Jan 92)

Summary

Lake Mackintosh and Lake Rosebery both have large populations of self supporting brown trout with an additional small population of rainbow trout in Lake Mackintosh. The rainbow trout sampled from Lake Rosebery were all from the 1991 liberation.

Lake Mackintosh contains fish similar in size and condition to that of Lake Sorell with the occasional fish over the 2kg mark. Lake Rosebery, on the other hand, contains a population of small brown trout and the rainbow trout liberated in 1991.

Angling Potential

Of the two waters surveyed Lake Mackintosh stands out as the water which should be the most appealing to anglers.

Adequate camping and boat launching facilities are available near the Tullabardine Dam area. However, due to the steep terrain, access for the shore angler is limited. The lake does provide excellent potential for the boating enthusiast. For those anglers who appreciate scenery equal to that of Lake Pedder and fish of the quality of Lake Sorell, Lake Mackintosh provides both.

With the new road opened through Hampshire, Lake Mackintosh is now only one hour's drive from Burnie. North West Coast anglers should certainly take advantage of this and add Lake Mackintosh to their list of waters to visit next season.

The lake is open for angling from August through to the end of May and natural bait as well as lures are permitted. From all accounts early season trolling from boats using lead lines as well as surface lures is very productive. Anglers fishing after dark with mudeye patterns, fish cakes and frogs have also been successful in the past.

The rainbows liberated in Lake Rosebery should provide their best sport this season and this will also be worth watching to see how they go.

Any fishermen who do decide to take advantage of these angling resources should take into consideration that the lakes are situated on our west coast, so pack a raincoat!

Lake level agreements with the Hydro-Electric Commission

Andrew Sanger, Scientific Officer, Inland Fisheries Commission

Anglers are the most numerous secondary users of HEC storages. Some of our most important and productive fisheries are in these storages, and water quality and water level conditions can determine, to a large extent, the condition of trout in them. The recent deterioration in the fishery and water quality in Lagoon of Islands was overcome, to a large extent, by controlling the water level within a range that promoted a healthy ecosystem in the lagoon.

Other issues relating to lake levels in HEC storages also affect the way anglers view and use the lakes. These include boating access and safety, the behaviour of trout under different conditions, and opportunities for visual angling methods (eg polaroiding, fishing to tailers) versus more remote methods (trolling, bait fishing, blind fly fishing).

This article describes the details of several important recent agreements between the HEC and the IFC on controlling lake levels to promote better angling. The rationale behind each agreement, its duration, and operational information are outlined to bring anglers up to date.

Important news on changes to the future operation of Bronte and Shannon lagoons concludes the article. Anglers should pay particular attention to these lagoons this season, as improvements to these fisheries are expected.

Little Pine Lagoon

Description: Tasmania's premier fly fishing water was created in 1955 by the damming of the Little Pine River. Water is diverted from this small storage to Lake Echo via Monpeelyata Canal.

The lagoon has a full supply level (FSL) of 1007.07m, and a normal minimum operating level (NMOL) of 1005.85m.

Existing water level agreement: A fisheries minimum level of 1006.33m applies and is subject to a payment from the Commission to the HEC for the value of the extra water lost to evaporation by maintaining this level.

Duration: December to February inclusive each year.

Rationale: The fisheries minimum level is designed to allow for an extension of the spring high water period which occurs due to high inflows from the Little Pine River. This allows for high water levels during the summer dun hatches. Successful shore based and boat based fishing to rising fish is thus encouraged.

Operational background: The agreement lapsed temporarily during the summer of 1991 due to administrative changes at both the HEC and IFC. This led to some of the lowest summer levels seen at the lagoon, and coincided with a severe deterioration in water quality as evidenced by very turbid water, and an algal bloom. The cause of this deterioration in water quality is unknown, however, it is most unlikely that external processes, such as run off of nutrient rich water, were responsible.

It is possible that the low summer levels at the lagoon encouraged a greater number of swans than normal to feed there leading to nutrient enrichment by the addition of droppings, a problem which has been recognised in several overseas studies. The problem may also have been exacerbated during the 1991 summer by the persistent drought which had dried up many of the lowland swamps typically inhabited by large numbers of swans.

Water quality in the lagoon rapidly improved in winter 1991 following flushing by nutrient poor water from the Little Pine River, and no problem was detected during the water quality survey programme run during the 1991-92 season. With the experience of summer 1991 behind us, and an expanded capacity to monitor water quality deterioration in lakes supporting major fisheries, the importance of maintaining a high summer level in Little Pine for both angling and water quality considerations has been recognised. Consequently, the Commission, along with the HEC, are working to ensure the continued operation of the existing agreement.

Penstock Lagoon

Description: Another fly fishing only water, Penstock Lagoon was constructed in 1915 as part of the first stage of the Great Lake power scheme. Following development of Poatina Power Station, the closure of Shannon Power Station and scaling down of Waddamana Power Station, the lake receives the majority of its water via natural catchment pickup. There is also limited release via Shannon Lagoon to meet riparian demand in the Ouse River.

FSL – 919.55m, NMOL – 919.43m.

Existing water level agreement: A fisheries minimum of 919.5m applies

Duration: All season.

Rationale: With minimal requirements for water from Great Lake since the advent of Lagoon of Islands releases for Ouse River irrigators, and with little or no power generated through Waddamana, there would be little reason to hold water in Penstock Lagoon if not for the important fishery located therein. The HEC has acknowledged the importance of this fishery in the past by supporting the existing fisheries minimum agreement.

The whole question of water quality in Penstock Lagoon has been of considerable concern to anglers in recent years. Dirty water from Shannon Lagoon has been released to Penstock with consequent dissatisfaction. The inability to use Lagoon of Islands waters for riparian demands in the Ouse River has been the major reason for releases of Shannon water. It is anticipated that the success with restoring Lagoon of Islands will reduce the need for Shannon releases. Work is also underway to try and improve water quality in Shannon Lagoon (see below) but this will not be immediate.

Operational considerations: The future of Waddamana Power Station and all associated works are under review this year by the HEC. A major component of this review focuses on the future of Penstock Lagoon, particularly in relation to the adequacy of the current spillway to cope with flood flows if the power station is no longer to be used. All available options are under consideration, and the interests of anglers are being represented by the IFC in the initial stages whilst there will be opportunity for public comment should there be any proposal to alter the current operation of the lagoon.

Initial inquiries on any of these matters should be directed to Dr Sanger of the IFC via your local angling association or club.

Lagoon of Islands

Description: Originally a shallow natural swamp of considerable scientific interest, the level of Lagoon of Islands was raised in 1964 by construction of a dam at the outflow of Blackburn Creek. The lagoon is an artificial lure only water which, apart from a brief period during the late 1980's and early 1990's when poor water quality resulted in a deterioration in the fishery, is renowned for producing trophy specimens of both rainbow and brown trout.

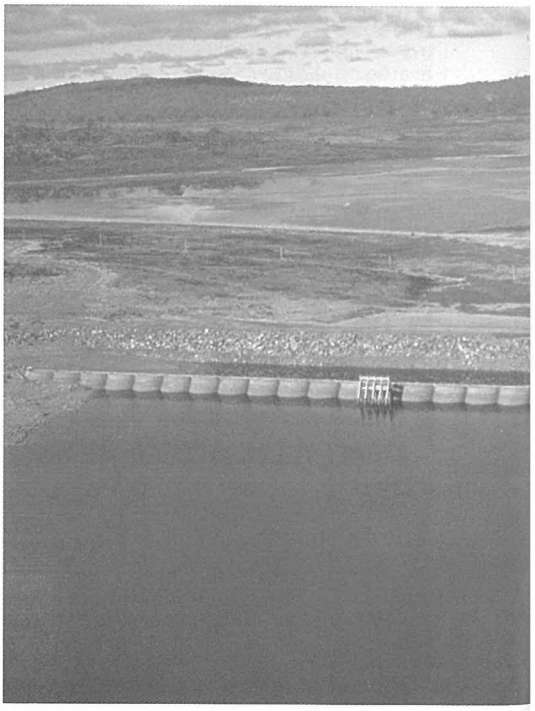
FSL 760.41m, NMOL 758.34m.

Existing water level agreement: A fisheries minimum of 758.34 applies. A maximum of 759.4 m (ie 1m below full supply level) has been set as a result of the Lagoon of Islands study (see below).

Duration: The lagoon is filled to the target maximum level by the beginning of January. Releases for irrigation supply will take the level down to the fisheries minimum by the end of April.

Rationale: The severe water quality deterioration in the late 1980's was caused, at least in part, by the inability of the strapweed population to compete with phytoplankton for nutrients. Strapweed growth was not favoured by the high water levels which followed the diversion of nutrient rich Ripple Creek water into the lagoon.

Following a reduction in water level over the last couple of years, due to restricted use of the Ripple Creek diversion, the strapweed population is growing vigorously once more. At the same time, the algal blooms have declined and nutrient concentrations are low. In view of this success, the maximum level suggested by the IFC in interim management proposals to the HEC has been adopted for future operation of the lagoon.



Shannon Lagoon (Great Lake in foreground)

The existing minimum level has been in place since the construction of the dam, and is designed to leave sufficient water in the lagoon to allow the trout population to survive the low water period.

Operational considerations: A very detailed study of the water quality and fishery problems at Lagoon of Islands by both the IFC and the HEC has resulted in a complex operating rule for the lagoon and its catchment. The lake level control outlined above is one component of this operating rule. Other aspects of this operating rule relate to the use of the Ripple Creek diversion which is being minimised in both duration and content so that the lagoon contains only enough water each year to meet fishery and irrigation requirements. This control over the inputs to the lagoon will ensure that nutrient enrichment of the waters of the lagoon is minimised. Anglers should be aware that the lagoon remains in a very delicate state, and that further enrichment of the lagoon may exceed the capacity of the macrophytes to compete with the phytoplankton.

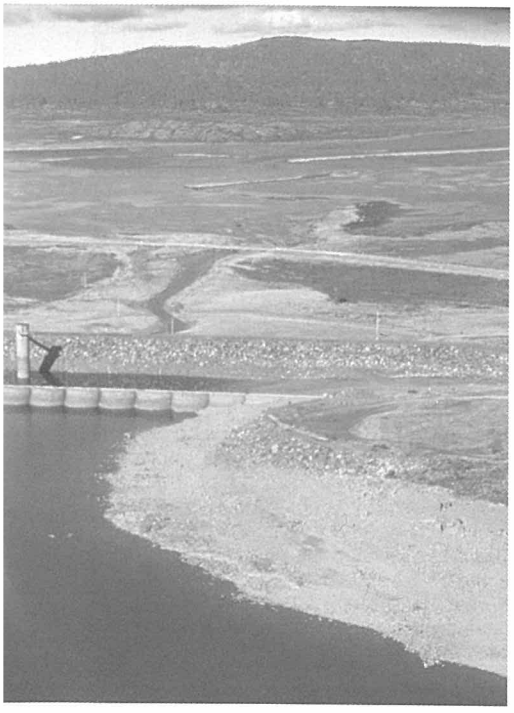
Further negotiation is taking place with landowners in the Lagoon of Islands and Ripple Creek catchments to minimise nutrient input to the lagoon. Anglers can also play their part in reducing nutrient transport to the lagoon, by ensuring that any toilet wastes are disposed of by burying well away from the lagoon or any of the inflowing creeks.

Shannon Lagoon

Description: Shannon Lagoon has seen many changes in water level control over the years (see below). Currently the lagoon is a shallow, muddy, unattractive water for most of the year.

FSL – 1017.66m, NMOL – 1016.96m.

New water level agreement: No formal agreement has existed in the past. As part of the IFC/HEC consultancy, a new water level agreement is to be trialed from this year. A new minimum level of 1017.3m is to be adopted. The Miena pump will activate when the storage reaches 1017.55m, and will cut out at the new minimum. Releases from Great Lake will be required to maintain the new minimum level during summer.



Duration: The new operating rule will apply year round on a trial basis. The rule will be made permanent if improvements in the ecosystem and fishery of the lagoon are achieved (see below).

Rationale: The new water levels are intended to allow weed growth to stabilise the loose sediments in Shannon Lagoon. The critical period when most of the damage is done to the weed beds in the lagoon is during the winter when the Miena pump is used to try and maintain the lagoon level at NMOL. This results in exposure of large areas of the lagoon bed to the air and allows frost damage to the macrophtytes. The new minimum level will allow for the bare sediments on the lagoon bed to be covered by water for the entire year. This should encourage weed growth, and protect the young plants from frost damage during the winter. Weed growth should stabilise the sediments leading to a reduction in turbidity over time. Bear in mind that this will not result in an immediate solution – it will take time.

Historical water levels and operational background: The phases of development at Shannon Lagoon may be split into four periods.

Before 1915 the natural lagoon at the outflow of the Great Lake received unregulated flow via the upper Shannon River, and discharged unregulated flow to the lower Shannon River.

With the original Great Lake Power Development, a dam on Shannon Lagoon raised FSL to 1017.51m. In 1950 FSL was raised a further 34cm to 1017.85m. Between 1915 and 1964 all flow from Great Lake passed through Shannon Lagoon to the Shannon and Waddamana power stations.

In 1964 the Poatina development led to almost total cessation of flow through Shannon Lagoon. At the same time FSL was raised to 1018.03m. Releases from Great Lake through Shannon Lagoon were primarily made during the summer to provide for irrigation requirements in the Ouse and Shannon rivers. Releases from Lagoon of Islands are now the primary source of this water, and so the amount released through Shannon Lagoon is limited to that which cannot be met from Lagoon of Islands. The Miena pumps also began pumping water from Shannon back into great Lake during the winter and spring pick-up periods at this time. There is some anecdotal evidence that the lagoon silted up significantly during the construction of the third dam at Miena. Comparison of aerial photographs from the 1940's and 1950's with more recent shots from the 1980's and 1990's show that the deeper channel of the Shannon River as it passes through the lagoon has silted up quite badly since cessation of major flow through the lagoon.

In 1973 HEC engineers reviewed the capacity of Shannon Lagoon spillway to cope with a severe flood. They concluded that the spillway level of 1018.03m was unsafe because of the danger of the dam being overtopped in a severe flood, which could have led to failure of the dam. The spillway height was lowered to the current FSL of 1017.66m in summer 1975. In August 1975, a severe flood reached a peak height of 1018.8m, ie more than 1.1m of water over the spillway level. This seems to justify HEC concerns over the safety of the high spillway level of the late 1960's and early 1970's.

A review of water levels which have existed in these phases of development is underway. Obviously, the lagoon was at its peak as a fishery in the early years, when a constant regulated flow of clear water from Great Lake maintained high and stable levels of clear water. During this period the famed Shannon Rise was at its peak. Water level was no higher between 1915 and 1950 than the newly negotiated agreement and so the new level will simulate the relatively high and stable levels of that period. However, there is also no scope for increased flow through the lagoon as the efficiency of generating electricity through Poatina makes water in Great Lake the most valuable in the state. Therefore there is no scope for resurrecting the Shannon Rise, however, the stillwater fishing in the lagoon may well improve although the extent and effects of siltation are difficult to assess.

The success of the new operating rules will be assessed by regular sampling of water quality and macrophyte growth. At the same time anglers should seek to make use of the lagoon as a fishery, particularly since the high water levels should encourage tailing fish into the shallow bays near the Shannon River inflow and on the eastern shore of the lagoon. Telegraph Bay is also worth a look. A good dun hatch occurs in the narrow bay near the dam, and with less turbid water expected in the future, a decent rise may be expected.

Bronte Lagoon

Description: Bronte Lagoon is a small shallow storage formed in 1953 by construction of a dam on Woodwards Marsh. Water enters Bronte Lagoon from Pine Tier Lagoon via the Bronte Canal and from the Clarence River and Laughing Jack Lagoon via the Clarence pipeline. Water leaves Bronte Lagoon via Woodwards Canal to Bradys Lake.

FSL – 665.97m, NMOL – 662.33m.

Existing water level agreement: An informal agreement exists whereby the HEC attempts to maintain water level in Bronte above 664.5m. for the duration of the fishing season. Bronte Lagoon has often been below this level during the fishing season in recent years.

New water level agreement: A target stable level of 665.0m has been set on a trial basis.

Duration: The target level will be trialed between the beginning of the fishing season and Christmas this year.

Rationale: Anglers have often expressed the view to the Commission that a more stable level in Bronte Lagoon would provide for more predictable fishing conditions. The Commission supports this view, and has negotiated for this change to the operation of Bronte Lagoon in order to assess the benefit to anglers. The success of the change will largely be determined by the views of the anglers who use Bronte. An intensive creel survey and interview programme will be conducted during the trial period to determine the views of anglers.

The trial period encompasses the spring and early summer seasons at Bronte, when the majority of fly fishing to tailing fish feeding on frogs and terrestrial food occurs. Continuation of the new operating rules beyond the trial period will be negotiated by the Commission if there is a demonstrated benefit to anglers.

Operational background: The only practical control on the level of Bronte Lagoon is via the outflow gates at Woodwards canal. No control on inflows is practical. Therefore the operating procedure will entail an HEC patrol-

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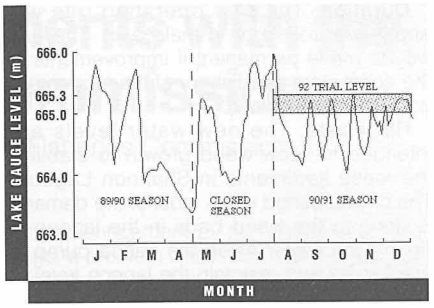
man assessing the level of the lagoon and the amount of inflow on a regular basis (daily) and adjusting the gates at Woodwards Canal accordingly to attempt to maintain a stable level.

Bronte Lagoon will still rise quickly, because the inflows will often exceed the capacity of Woodwards Canal to get water out of the lagoon. However, the agreement will dampen the effect of the rapid drop in level which has been typical of Bronte Lagoon, and the minimum level will still provide for good fishing along the flooded tussock areas on the Long Shore, for example.

Extension of the trial period beyond Christmas is complicated by HEC releases of water from the lagoon to provide for canoeists using the whitewater run at Bradys Lake. The dates of likely releases for this purpose will be obtained by the IFC, and publicised in future newsletters and the angling columns in newspapers. Anglers should note that Bronte Lagoon is very likely to drop rapidly on these days and be unlikely to produce good fishing conditions.



Bronte Lagoon water levels

Lake Burbury

Andrew Sanger, Scientific Officer, Inland Fisheries Commission

Background

Construction of the King River Power Development (KRPD) was authorised in 1983 following cessation of Stage 2 of the Lower Gordon River Power Development. The KRPD involved the construction of a single storage on the King River (Lake Burbury) of some 47km2 (the size of Lake Sorell) which will harvest the 2.5 to 3.5 m of annual rainfall in the 559km2 catchment. The lake has a full supply level of 235m above sea level and a normal minimum operating level of 229m.

The KRPD Environmental Plan and other preceding reports have stated that it was desirable for the new storage on the King to have adequate water quality conditions to enable the trout fishing potential of the lake to be developed. Heavy metal pollution entering the King River via Linda and Comstock creeks has long been recognised as being environmentally damaging. These streams drain into the new storage, and the predicted effect of this pollutant input has been examined by the IFC and others. The consensus opinion in these reports was that the predicted concentrations of heavy metals, particularly of copper, in the new lake were unlikely to be conducive to the development of a self-sustaining recreational fishery. An estimated 85% reduction in copper load was thought necessary to meet recognised water quality standards. The IFC report also recommended 85% reduction in copper load to allow the development of a trout fishery.

A very detailed study of the relative contributions of the various sources of pollutant in Linda and Comstock creeks has been prepared by the Water Resources Department of the HEC. This study found that about 70% of the total copper load in the King at Crotty entered via Linda Creek, and 25 % via Comstock Creek. The copper emanated from a number of different sources within these catchments including old mine adits and tailings dumps. A background level of about 5% of the total load was also estimated for the King above Comstock and Linda. Options for reducing the pollutant loads in each creek have been suggested. These include:

- sealing of old tailings dumps to reduce leaching losses;
- passive diversion of the polluted outflows from several disused adits into the catchment of the East Queen River or back into the Queen River drainage via the Mt Lyell mine;
- active pumping of polluted waters into the Queen River drainage.

HEC cost estimates on the various options for reducing pollutant loads showed that the option of active pumping of the majority of the polluted flows required several million dollars of capital works and an ongoing annual commitment of several hundred thousand dollars for pumping costs. Passive diversion of the Adit 5 input into Comstock Creek, (10% of total load) and the Crown Lyell input into Linda Creek (21% of total load) could be achieved for comparatively little cost. Also, the sealing and vegetation, at comparatively little cost, of old tailings dumps which should reduce, to some degree, the copper load (20% of total) into White Creek.

Work has proceeded with the diversion of Adit 5 and Crown Lyell inputs, thus bringing about a theoretical 30% reduction in total load. Also, the Mt. Lyell mining company has begun revegetation experiments on tailings dumps, hence some further reduction in total load may be expected. Together, these reductions (30-50%) fall well short of the predicted requirements and the predicted copper concentration will still be above the suggested target level. There is therefore concern over the possible effect on the development of a recreational fishery in Lake Burbury.

Instead of committing to the expensive pumping option to achieve the predicted level, the HEC has supported a monitoring programme on the water quality and biology of the new lake via the IFC/HEC consultancy in combination with the passive diversion works detailed above.

The monitoring programme has several objectives:

- to monitor the development of the physico-chemical environment of the new lake;
- to monitor the level and distribution of metal contamination in the water and sediments of Lake Burbury;
- to assess the effect of this contamination on the productivity of the lake;
- to monitor the fish population and development of the fishery in the lake.

The results of this monitoring programme will be used to decide whether further reduction in copper load is necessary to achieve the goal of establishing a recreational fishery in the new lake.

The monitoring program

A sampling program has been established to achieve the objectives listed above. The essential features of the programme are outlined below.

Water sampling: A number of sites have been established around the lake including sites adjacent to both polluted and unpolluted inflows as well as mid lake stations. Water samples and physical measurements are taken at the surface at all sites, and over the depth range at some sites. These samples are analysed for the various forms of heavy metals (ie toxic and non toxic forms), as well as for other relevant chemical and physical parameters.

The fishery: With colonisation of the lake by trout, several features of the developing fishery will be monitored. A systematic netting survey of the lake has begun to monitor colonisation of the various areas of the lake. The heavy metal levels in the trout will be measured to assess their suitability for human consumption. The distribution of fish in the lake will be mapped to determine if any avoidance of heavily polluted sections of the lake is occurring. The growth rates, physiological condition, and reproductive success of the trout will be assessed and compared with data from trout populations elsewhere, in order to measure the effect of heavy metal contamination.

Water quality: Water samples have been taken in September, October and December 1991 and February, April, and June this year.

Physical measurements taken in the lake in October indicated that at that stage the lake was well mixed over the depth range at most sites. In December, February and April the lake was quite strongly stratified thermally (ie there was a distinct warm surface layer of water overlaying a cooler deep layer. Because of the large amount of organic decay taking place in the lake, and because the surface waters and bottom waters do not mix when thermally stratified, the bottom waters had low dissolved oxygen and high hydrogen sulphide levels for this period.

When releases of water from the power station began in late March 1992, the smell of hydrogen sulphide was quite noticeable, on occasions as far away as Queenstown. Also, the low dissolved oxygen level in the water coming through the station was seen as a potential threat to aquatic life in Macquarie Harbour. A study of these problems before and after Easter showed that while the hydrogen sulphide odour was offensive, it was not at dangerous levels. The problem of low dissolved oxygen in Macquarie Harbour was overcome by air injection at the power station.

Recent sampling at the lake and in the tailrace of the power station has shown that with the onset of cooler weather, the lake has now become less strongly stratified. This has alleviated the need for air injection at the power station, and indicates that Lake Burbury is following the typical cycle of lake development which has been observed at several other well studied west coast storages.

Heavy metal concentrations in the new lake have been somewhat lower than the

levels predicted in environmental studies completed before the construction phase of the project. This is probably due partly to the diversion works undertaken by the HEC and the Mount Lyell Mining and Railway Company, and also because the filling period coincided with a very wet spell which may have diluted the polluted inflows to a greater extent than expected.

A stable pattern of copper concentration seems to be developing in the lake. The upper basin, ie north of the new Lyell Highway bridge typically has a copper concentration of between 20 and 25 µg/L. Higher concentrations have been found close to the polluted inflows at Linda and Comstock creeks. The lower basin, ie near the dam, and the arms of the Nelson and Governor rivers have a lower copper concentration (typically in the range between 8 and 15 µg/L). These concentrations are all higher than the target figure suggested in the earlier environmental reports. However, recent work by the Department of Environment and Planning suggests that a large percentage of this copper may be complexed or bound with organic matter in the water and is therefore harmless to fish. Further detailed work on the chemistry of this binding process is proposed.

At the same time as the netting survey was being done (see below), rainbow trout were held in cages at various sites in the lake for a period of ten days. The sites chosen were adjacent to the inflow of Linda Creek, at the new bridge, at the dam and in the Nelson River arm. All fish at the Linda Creek site died within four days of beginning the experiment. All fish at all the other sites survived the full ten days and appeared to be under no stress from the prevailing conditions. These results confirm the toxic nature of the Linda Creek pollution as it enters the lake. The fact that the fish held at the bridge site survived a ten day exposure to moderately high copper concentration suggests that the majority of the copper in the lake may be in the relatively harmless form described above.

Fishery development

Electrofishing data collected prior to flooding indicates that the Princess, Nelson and Governor rivers as well as the upper reaches of the Eldon and South Eldon rivers will contribute the greatest number of trout, through natural recruitment, to the new lake.

A test netting survey was recently undertaken in the Nelson and Governor arms of the lake.

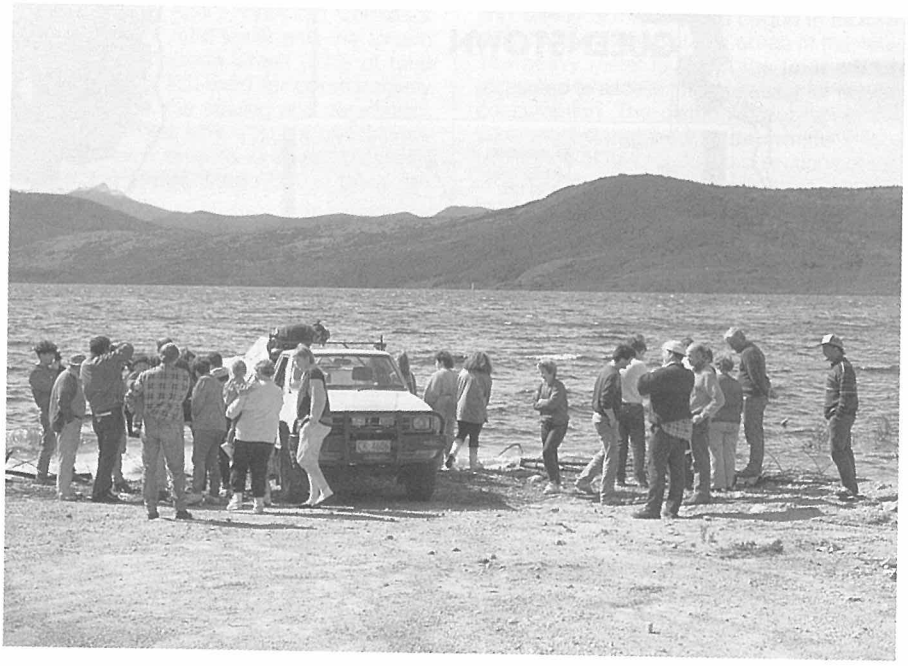
Ten nets were set for two nights in each area. The nets were checked daily. A total of 22 brown trout were captured, ranging in total length from 223 to 421mm with an average of 301mm. The heaviest fish collected weighed 930g. The small number of fish caught over such a length of time indicates that the population of trout in the lake at present is small.

Scale sample analysis of the fish taken shows that at the time of flooding the fish found in the lake had a very similar age/size ratio to that of normal river fish in the area. However, since moving into the lake after it began to fill, growth rate has increased considerably. *(See graph – inset on previous page.)*

Interestingly, several fish from the lake showed short checks in growth during this growth spurt. The most likely explanation for this would be that conditions in the lake became stressful to the trout for a short period causing them to stop feeding. These stressful conditions could be due to the upwelling of oxygen depleted and hydrogen sulphide rich water described above. Other than these short checks the trout appeared to be developing at an excellent rate, with an average 80% increase in length in the period since they entered the lake. Most individuals caught showed a body shape typical of rapidly growing fish. The gut contents showed a predominance of midge larvae. The combination of results from the netting survey and the cage trials is therefore quite promising. The growth rates of the trout captured in the nets suggest that some fish in the two to three kilogram range will be available next year.

On 13 September 1992 the Commission released approximately 200 000 brown trout fry into the lake. These fish should supplement the natural recruits to enhance catches over the next couple of years. Beyond that time the population of adults in the lake should be sufficient to allow natural spawning to maintain adequate stock for the lake. The Eldon, South Eldon, Nelson and Governor rivers will be the main spawning streams. It is also likely that many of the small inflowing creeks will be used by trout for spawning, in much the same way as occurs at Lake Pedder.

Spectators at the recent fry release in Lake Burbury



Angling, access and public facilities

The variety of bays and channels that have been formed by the lake, particularly in the Nelson and Governor arms, provide spectacular scenery and excellent protection from prevailing weather conditions. Shore access in the Nelson and Governor is very limited due to the steep hillsides and thick vegetation. These areas will be mainly suited to boat fishing. Users of smaller boats would need to watch for changing weather conditions when fishing within sheltered arms as some of the more exposed channels can chop up quickly.

Other potential angling sites include several areas of flooded grassland on the eastern shore of the lake between the bridge and the old Lyell Highway. This may prove to be popular with fly fishermen. Similar areas on the western shore of the lake on both sides of the new bridge will also be worth a look. The inflow of the King River may also provide interesting fishing and access to good stream fishing in the Eldon and South Eldon rivers. Trolling will be possible over the majority of the new lake.

There are several points where access to the lake can be gained from the road. The most notable of these is the area of flooded grass land along the southern arm of the lake (between the Crotty and Darwin dams). This section is about 3km long and is easily accessed through south Queenstown off the Mt Jukes Road which runs roughly parallel to the shore. There are two boat ramps along this section – the first is adjacent to the mouth of Traveller Creek and the second is a further 2km along the Mt Jukes Road. Both ramps are easily accessed by passenger vehicles and have ample room for parking and turning. However, due to their fairly gentle gradient, caution should be exercised when launching larger boats. *(See map – previous page.)*

Other boat ramps available at present are in the area of the new bridge. The most suitable of these for two wheel drive vehicles is the one formed by the flooding of the old Kelly Basin Road which turns off the Lyell Highway 1.5km past the bridge on the western side. This ramp is best suited to smaller boats as turning and parking is very limited. The area where the old Lyell Highway enters the new lake just north of Linda Creek (western shore) is also a suitable access for boats. The ramp at the picnic ground to the north-east off the Lyell Highway bridge is unsealed and quite steep. It is probably best suited to four wheel drive vehicles.

Summary

The future for Lake Burbury looks quite promising. Anglers should keep the potential of this storage in mind when deciding on their fishing trips for this season. Although the number of fish in the lake will be small, some exploratory work may pay off with fish in the two to three kilogram range. The fishing should improve over the next two to three seasons as the number of fish increases. The suitability of the environment in the lake for trout will be monitored regularly for at least the next two years, and if problems arise with the trout population then further work to improve the water quality in the lake may be necessary.

Willows – it's just not cricket

Dr Peter E Davies
Senior Scientific Officer
Inland Fisheries Commission

Every year anglers around the State are heard cursing and mumbling about the scourge of the willow. These invaders of our stream banks have been around since early settlement when they were introduced for their scenic and nostalgic qualities. One story has it that cuttings were brought from the site of Napoleon's grave on St Helena.

The willow has spread particularly rapidly during the last 50 years, establishing a toe-hold in nearly all the rivers of our rural landscape from the far north west to the east coast and south of the Huon. The willow is only prevalent where land has been cleared to the river bank and indeed many farmers have deliberately planted them for erosion control when cleared banks have started to break away.

The species responsible for all this is the Crack Willow, known scientifically as *Salix fragilis*. The chief reason for the invasiveness of this plant lies in its ability to shoot from small pieces of branch or twigs broken off during floods, wind, mechanical disturbance or by deliberate action. The branches of this willow species are brittle – hence the word crack.

The crack willow is obviously not your average fisherman's friend. It makes casting difficult, often impossible, and access to river banks is frequently impeded. The tree invades watercourses with its roots, often converting small streams into swampy backwaters, filling the channels to the point where flood waters are forced to spill over the banks and drown valuable farming land. The willow roots slow the speed of the water, causing it to deposit silt more readily, thereby enhancing stream silting.

The willow is also a water consumer. Estimates from Sweden indicate that willows use water at a rate of around two to three litres per day for every square metre of ground covered by the canopy. That is, a typical river crack willow will remove around 15 thousand litres in a summer. That means that for a reach of willow infested stream, a significant portion of the summer flow may be removed through willow roots and evaporated into the air. Taking the Meander River as an example, around 50% of the river banks from Hadspen to Deloraine (a distance of around 50 km) are infested with willows. Typical flows at the Strath bridge during summer are around 100 million litres a day. Willows are removing around two million litres a day from the main river channel alone – not counting tributaries. This figure, based on overseas data, suggests that only around 2% of the flow is removed by willows. Many people suspect that the impact is far greater and we won't really know until a detailed study is done in Tasmania. The greatest effect could in fact be on smaller streams. However, all figures that you may hear quoted are mere guesswork. Perhaps the time has come to give these heavy drinkers a breathalyser test!

Willows are also responsible for changing the nature of the streams they infest in more subtle ways. Stream side vegetation provides food for stream insects that form the diet of trout and other fish by dropping leaves and twigs into the stream. This material decomposes slowly and forms a large part of the basis of the stream food chain. Native plants, particularly eucalypts, drop their leaves continually through the year, with most leaf fall occurring during the summer months. In contrast, willows follow the deciduous pattern, heavily shading sections of the stream during the summer and dropping large quantities of leaves over a relatively short period in late autumn. This causes the types and abundance of stream insects in a willowed section of stream to be very different from that of a native vegetated one.

There are so many negative things to be said about our crack willow problem. Are there any positive sides to having willowed stream banks? The main one concerns rivers with degraded banks. River banks that are actively eroding are difficult to stabilise by planting native vegetation which takes longer to bind the soil. Willows are therefore an aid to restoring river banks. However, this doesn't come cheaply for these planted willows may also then spread downstream. They should be controlled and replaced with natives as soon as practical.

Willow infestation along a midlands stream

A recent report from Western Australia has also indicated that stream willows are effective at absorbing pesticides such as organophosphates. Studies by the Commission indicate that levels of these chemicals in our streams are rarely high enough to be of concern, so this is only a small plus in a Tasmanian context.

What can be done to control them?

There are basically two main ways of controlling or eradicating willows. The most obvious is by mechanical means – heavy machinery pulling or digging out whole trees. Often this can lead to bank damage, enhanced erosion and reinfestation of downstream reaches from broken material floating off during the operation. It also frequently leaves buried root or branch material ready to resprout later. One machine that seems best suited for mechanical removal is a hydraulic crab-grab and log-shear which pulls trees from the banks. However, no machine can completely overcome the problems of bank damage and debris loss downstream. It is therefore recommended that such operations be performed on trees that have been poisoned beforehand. Erosion can be avoided by removing the trees gradually (one in every three) and interplanting with natives or less damaging willows (see below). Banks that may erode should be protected with rip-rap where possible.

The second method is chemical. Several systemic poisons are available on the market – notably Garlon – that are good candidates for willow control. Application may be by either frill cutting (a combination of axe cuts around the trunk and poisoning) or by painting on cut-stumps. Several trials are underway at present (see below).

The bottom line is money. All these methods cost money. One estimate puts the cost of returning a section of river to its pre-willow condition at around $10 000 per km. In the long term, chemical methods are likely to be the most economic due to the absence of bank damage and of the costly repairs that mechanical methods may require. Certainly all methods are not one-offs. Continued care and maintenance of the stream banks that have been cleared is necessary to ensure that reintroduction does not occur.

So, is anyone doing anything about it?

Gloomy talk about willows has been around for a long time in Tasmania and the problem is still here. Indeed, despite what is apparently a slowing rate of willow spread up and down our rivers, the intensity of the infestations, that is the density of willow growth at a particular spot, is still on the increase. Something needs to be done. And it appears, that for the first time there is a groundswell of activity in this area.

Landcare

The Landcare program is well established in this State with many groups taking an active interest in the one thing most members of a group have in common – their river. This means that willows are high on the agenda. Of 30 Landcare groups in the north, around ten are involved in some way in a willow control or eradication program. The MerseyLea Landcare group is carrying out a chemical trial on willows along the Mersey in which three poisons are being assessed – Garlon, Roundup and Brushoff. The results will not be known until after the spring. The Liffey and Bracknell groups are actively involved in bank clearing and stabilising on the Liffey river using mechanical removal of willows followed by planting with natives.

Rivers and Water Supply Commission

The RWSC supported a program of willow removal on the North Esk River two years ago, in which mechanical removal was used. Some banks are showing signs of erosion and secondary plantings will be used to stabilise them. The RWSC, along with the Forestry Commission, has imported four varieties of another willow species – the Purple Osier, *Salix purpurea*. This species has the advantages of rapid growth like the crack willow but does not have the problems of spreading from broken material and is less easily damaged by floods due to its more shrubby growth. The four varieties include the Booth and Pohegena willows, all are from New Zealand, and are currently in quarantine at

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Willow removal requires care!

Willows – it's just not cricket

Dr Peter E Davies
Senior Scientific Officer
Inland Fisheries Commission

Every year anglers around the State are heard cursing and mumbling about the scourge of the willow. These invaders of our stream banks have been around since early settlement when they were introduced for their scenic and nostalgic qualities. One story has it that cuttings were brought from the site of Napoleon's grave on St Helena.

The willow has spread particularly rapidly during the last 50 years, establishing a toe-hold in nearly all the rivers of our rural landscape from the far north west to the east coast and south of the Huon. The willow is only prevalent where land has been cleared to the river bank and indeed many farmers have deliberately planted them for erosion control when cleared banks have started to break away.

The species responsible for all this is the Crack Willow, known scientifically as *Salix fragilis*. The chief reason for the invasiveness of this plant lies in its ability to shoot from small pieces of branch or twigs broken off during floods, wind, mechanical disturbance or by deliberate action. The branches of this willow species are brittle – hence the word crack.

The crack willow is obviously not your average fisherman's friend. It makes casting difficult, often impossible, and access to river banks is frequently impeded. The tree invades watercourses with its roots, often converting small streams into swampy backwaters, filling the channels to the point where flood waters are forced to spill over the banks and drown valuable farming land. The willow roots slow the speed of the water, causing it to deposit silt more readily, thereby enhancing stream silting.

The willow is also a water consumer. Estimates from Sweden indicate that willows use water at a rate of around two to three litres per day for every square metre of ground covered by the canopy. That is, a typical river crack willow will remove around 15 thousand litres in a summer. That means that for a reach of willow infested stream, a significant portion of the summer flow may be removed through willow roots and evaporated into the air. Taking the Meander River as an example, around 50% of the river banks from Hadspen to Deloraine (a distance of around 50 km) are infested with willows. Typical flows at the Strath bridge during summer are around 100 million litres a day. Willows are removing around two million litres a day from the main river channel alone – not counting tributaries. This figure, based on overseas data, suggests that only around 2% of the flow is removed by willows. Many people suspect that the impact is far greater and we won't really know until a detailed study is done in Tasmania. The greatest effect could in fact be on smaller streams. However, all figures that you may hear quoted are mere guesswork. Perhaps the time has come to give these heavy drinkers a breathalyser test!

Willows are also responsible for changing the nature of the streams they infest in more subtle ways. Stream side vegetation provides food for stream insects that form the diet of trout and other fish by dropping leaves and twigs into the stream. This material decomposes slowly and forms a large part of the basis of the stream food chain. Native plants, particularly eucalypts, drop their leaves continually through the year, with most leaf fall occurring during the summer months. In contrast, willows follow the deciduous pattern, heavily shading sections of the stream during the summer and dropping large quantities of leaves over a relatively short period in late autumn. This causes the types and abundance of stream insects in a willowed section of stream to be very different from that of a native vegetated one.

There are so many negative things to be said about our crack willow problem. Are there any positive sides to having willowed stream banks? The main one concerns rivers with degraded banks. River banks that are actively eroding are difficult to stabilise by planting native vegetation which takes longer to bind the soil. Willows are therefore an aid to restoring river banks. However, this doesn't come cheaply for these planted willows may also then spread downstream. They should be controlled and replaced with natives as soon as practical.

Willow infestation along a midlands stream

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Willow removal requires care!

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the Perth nursery. The RWSC intends to trial these varieties on some drainage channels on Flinders Island and on some of the North Esk sites before recommending them for general use in the replacement of the crack willow for bank stabilisation. The RWSC is also seeking funds for a study into the spread of willows on the Meander River.

The RWSC has prepared a Willow Management Plan, details of which can be obtained from Steve Ratcliffe (003) 362414.

Others

The Department of Parks, Wildlife and Heritage is seeking funds for a comprehensive study of the spread of willows in the State. Groups of concerned anglers are also in on the act! For example, Trout Unlimited has instigated a willow control trial on a stretch of the Macquarie River. May there be more like them.

The future of willows

It is hard to be an optimist about the willow problem. In my opinion they are here to stay – unless some virulent willow disease is magically introduced! The problem is a community one. Rivers link our rural lands and willows use them as their corridor to move about. One lone landowner can do little to stem the tide. It is only by cooperative action of groups of landowners with considerable river frontage that the willows will be brought under control. The incentive introduced by the Landcare movement is a small example of the way we have to go to combat this threat. The Commission would certainly be keen to see angling clubs getting together with farmers in controlling willows on their favourite stretch of river. Cooperation is the only way we'll beat the problem.

PROSECUTIONS

Netters caught in the Huon River .....

On 7 May 1992 at the Huonville Court of Petty Sessions Craig Cowen and Geoffrey Thorpe of Ranelagh pleaded guilty to using a net other than a landing net and attempting to take fish by means other than a rod and line, namely by setting a graball net in the Huon River.

Magistrate G Bryan convicted and fined Cowen a total of $331 with six months to pay and Thorpe a total of $431 with four months to pay. Thorpe had prior convictions for taking spawning fish which Magistrate Bryan took into account when issuing penalties.

No fish were killed as the apprehending officer arrived as the net was being set. A boat and net were forfeited to the Commission.

..... and in Oatlands water supply dam

Phillip Laurence Howlett of Rokeby, Adrian Colin Barrett of Warrane and Richard John Broadribb, also of Warrane, were apprehended for setting and retrieving a gill-net in Oatlands Water Supply Dam on 22 and 23 February 1992. Three brown trout were taken by the offenders.

In the Hobart Court of Petty Sessions on 21 July 1992 Magistrate M R Hill imposed fines of $800, $600 and $500 respectively on each offender. For the three brown trout taken the Magistrate also added an extra $30 per fish special penalty to each fine.

Infringement notices

During the six months from 1 January until 30 June 1992 the following 'on the spot' fines were issued.

Offence	Number
Fishing without a licence	6
Fishing with more than one rod and line	10
Having the rod of another person under observation	2
Using bottle, jar, can or similar object as strike indicator	8
Fishing with unattended set rod	7
Possessing or using a net other than a landing net	1

Court proceedings

Also during the same period offences which were proceeded with by summons were finalised as follows.

Offender	Location	Offences Summary	Total fine + costs ($)
Shane David QUINN, Rocherlea	(BRUSHY LAGOON)	Closed waters/Assembled rod	331
Rebecca HARRISON, Launceston	(GREAT LAKE)	Unlicensed/Unattended set rod/Falsely representing to be licensed/False name and address	531
Garry John JARMAN, Karoola	(BRUSHY LAGOON)	Unlicensed/Falsely representing to be licensed/ False name and address	506
Gerard DILLON, New Norfolk	(DERWENT RIVER)	False name and address/Falsely representing to be licensed/ Possession of assembled rod	606
Steven Gregory TATNELL, Risdon Vale	(CRAIGBOURNE DAM)	Use strike indicator	131
Percy TATNELL, Risdon Vale	(CRAIGBOURNE DAM)	Use strike indicator/Unattended set rod	231
Barry BRIERS, New Norfolk	(LAUGHING JACK LAGOON)	Lend licence to deceive an officer	131
Lesley BEWLEY, Bridgewater	(LAUGHING JACK LAGOON)	Unlicensed/Produce licence of another person/ Use strike indicator	331
Adrian Bruce SHARAM, Deloraine	(MEANDER RIVER)	Unlicensed/Other than rod and line	231
Christian ROWLANDS, Buckland	(CRAIGBOURNE DAM)	Unlicensed	131
Lorraine Nancy BOSWORTH, St Marys	(BREAK O'DAY RIVER)	Unlicensed/Possession of assembled rod	280
Grant Dawson BARRON, Penguin	(TUNGATINAH LAGOON)	Use strike indicator	131
Richard BASSANO, South Launceston	(LAKE PEDDER)	Unlicensed/Falsely represent to be licensed/Other than rod and line/Possess natural bait/Use natural bait	531 susp. 300
Jamie Lloyd LUCK, Launceston	(LAKE PEDDER)	Other than rod and line/Possess natural bait/ Use natural bait	331
Victor McCULLOGH, Savage River	(PIEMAN RIVER)	Take whitebait/Possess net	431
Nick MITSAKIS, Penna	(LITTLE SWANPORT RIVER)	Take undersize bream/Possess undersize bream	81
Andrew TSOVILIS, Richmond	(LITTLE SWANPORT RIVER)	Take undersize bream/Possess undersize bream	81
Ian Joseph CLARK, Devonport	(BRUSHY LAGOON)	Unlicensed/Falsely representing to be licensed/ False name and address	406
Ross Hilton NICHOLS, Lutana	(BRADYS LAKE)	Unlicensed	51
Walter Sydney WILLIE, Smithton	(DUCK RIVER)	Take whitebait/Possess net	431
David Warren ATKINSON, Ulverstone	(FORTH RIVER WEIR)	Take whitebait	231
David McGeorge Boyd BANNER, Latrobe	(MERSEY RIVER)	Possess whitebait/Possess and use net	721
Paul Michael SHEEHAN, Latrobe	(GREAT FORESTER RIVER)	Take whitebait/Use net	1 031
Craig COWEN, Ranelagh	(HUON RIVER)	Use net/Other than rod and line	331
Geoffrey Arthur THORPE, Ranelagh	(HUON RIVER)	Use net/Other than rod and line	431
Garry Anthony RICHARDS, Sheffield	(BRADYS LAKE WHITEWATER)	Unlicensed/Possession of assembled rod/ Falsely represent to be licensed	331