TARGET TAUPO

A newsletter for Hunters and Anglers in the Tongariro/Taupo Conservancy

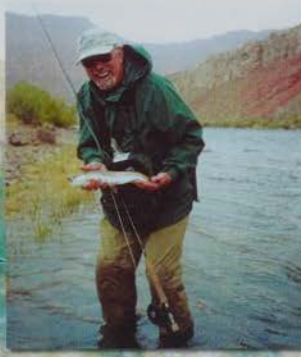
DECEMBER 2000, ISSUE 35

Department of Conservation
Te Papa Atawhai

For Americans, choosing a President has had its difficulties...

When choosing a Flyrod however, there is no contest!

American angler, John Hayes, and his INNOVATION 8554 with a rainbow from the Colorado River some 50 miles above Grand Canyon.



Brother Bill, also with his INNOVATION 8554 shows a nice little brownie from the slower moving Delaware River.

No way will Howard West of Scientific Anglers leave his rod unattended!

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TARGET TAUPO

A newsletter for Hunters and Anglers in the Tongariro/Taupo Conservancy

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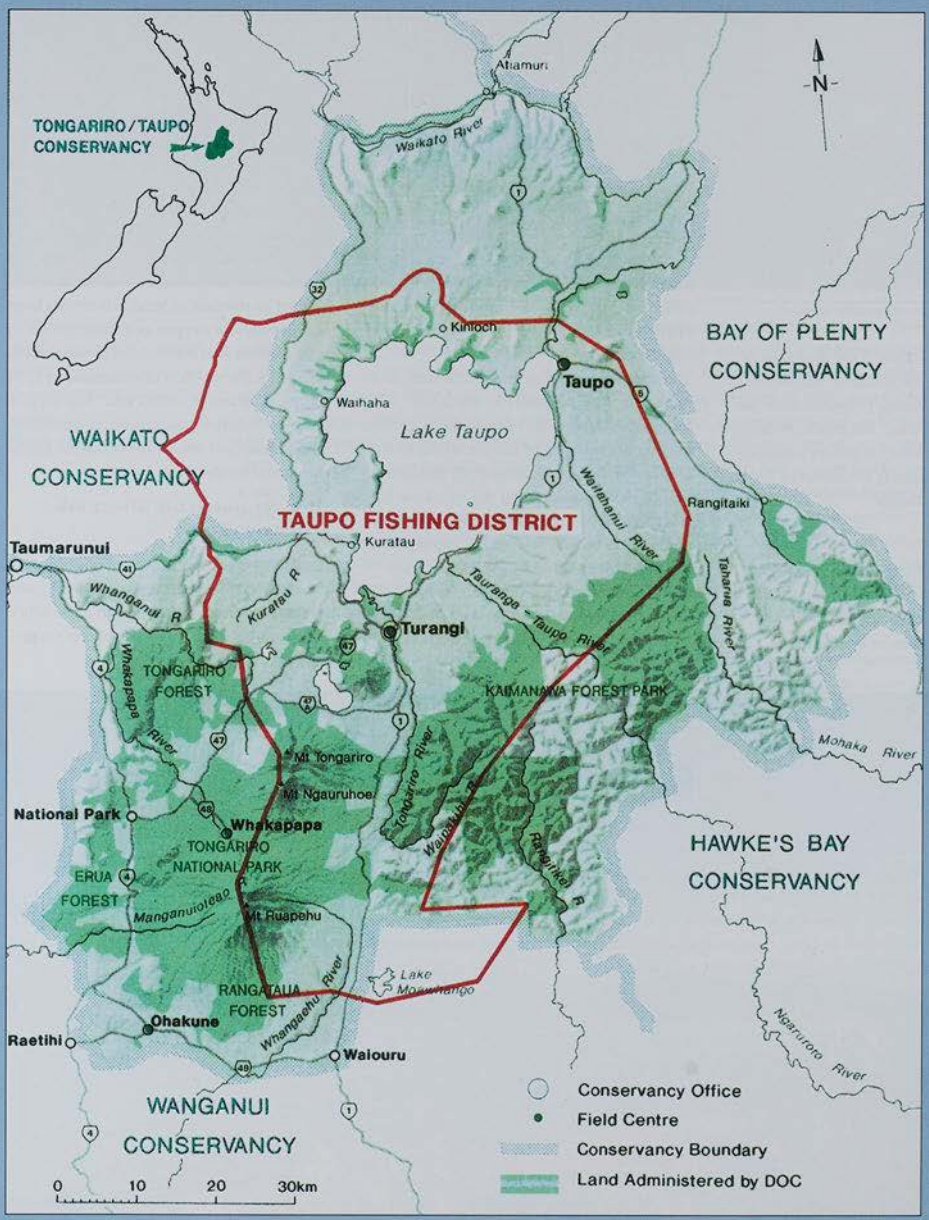


Changes in Lake Taupo Water Quality: How Will This Affect the Trout Fishery?

By Dr Michel Dedual and Glenn Maclean

Michel is the Fishery Area Scientist. Hailing originally from Switzerland, Michel is also a very enthusiastic angler

Glenn is the Manager of the research and monitoring programme in the Area. He is also responsible for fishery advocacy and is the editor of Target Taupo

We take clean water for granted, but unless we take action it may not always be like this

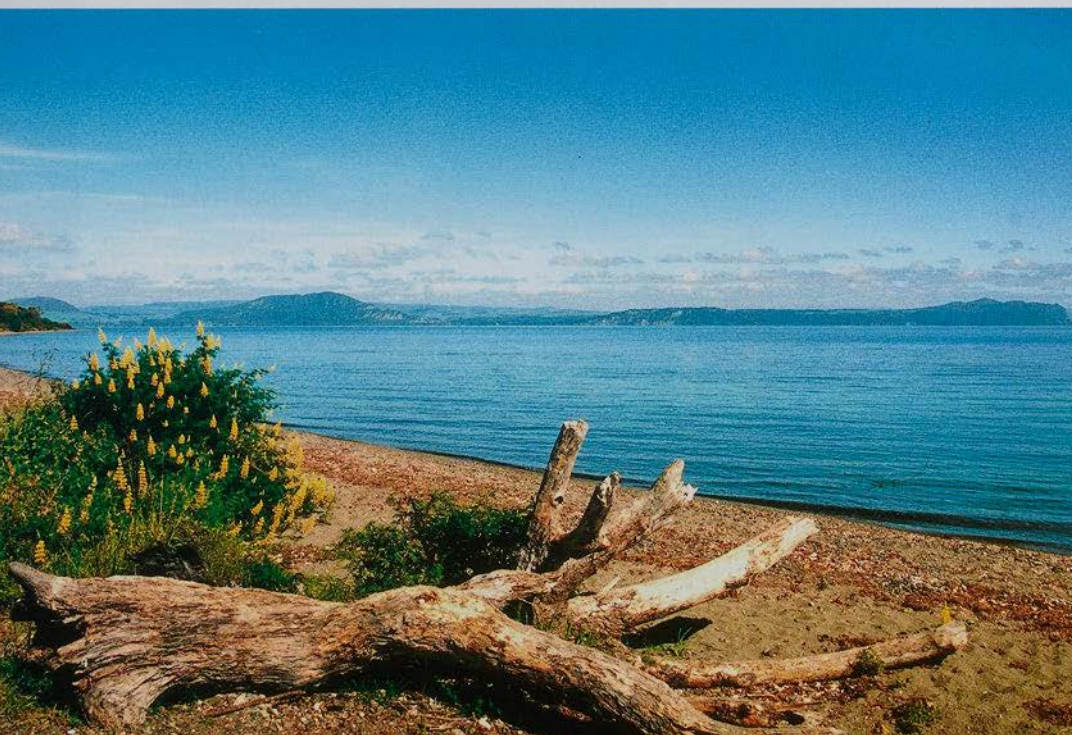
The increasing use of land for agriculture, forestry, and urban settlement within the Lake Taupo, catchment is threatening the lake's excellent water quality. Between 1974 and 1997 the amount of nitrogen entering the lake has doubled. What's more it is increasing at a faster and faster rate. This is reflected in a reduction in average water clarity from 15.3 metres to 14.2 metres over the last 20 years.

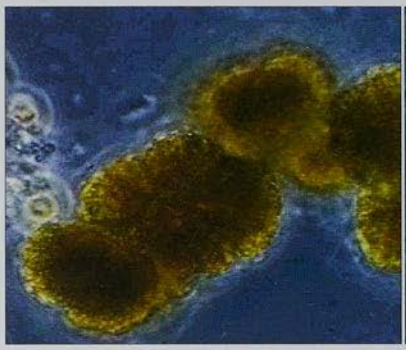
The major changes in the catchment have been the loss of tussock, shrubland and indigenous forests and increases in exotic forests, the number of people living in the area and in intensive farming. Of concern is that the nitrogen entering the lake now has taken up to 20 years to reach the lake from when it was initially released or dumped into the catchment. Therefore even if action is taken now to reduce nitrogen sources the amount of nitrogen entering the lake is likely to increase over the next few years.

Eutrophication (nutrient enrichment) is the single largest cause of water pollution worldwide, of which agricultural run-off is the main cause. It not only affects small ponds and lakes but also some large chunks of oceans. The eutrophication of the Baltic Sea and the Gulf of Mexico are well documented. In the Gulf of Mexico there is a large area depleted of oxygen as a consequence of algae blooms. This zone has increased considerably since it was first documented in 1974 and now measures 18000 km2. Not surprisingly it threatens the productivity of the commercial and recreational fishing industries based on the Gulf.

How do nutrients affect lake water quality?

Essentially lakes are bodies of water which exist sufficiently long for suspended particles to settle and the waters to clear. When the water is clear, phytoplankton (micro-





Two examples of phytoplankton. It is easy to see why water looks so murky when there are millions of these tiny plants present.

scopic free floating algae or plants) can use sunlight to photosynthesise. Photosynthesis is the process by which plants use the energy of sunlight to built complex substances from carbon dioxide and water. Light penetration as determined by water clarity is therefore a very important aspect of a lake.

Phytoplankton need oxygen, hydrogen, carbon (C), nitrogen (N), phosphorus (P), and traces of other minor elements to grow. The oxygen and hydrogen exist far in excess of their requirements. The C:N:P ratio of plant contents is roughly 40C:7N:1P by weight. The nitrogen levels of most natural waters exceed phosphorus levels by an order of magnitude (10 fold), or more. Therefore, phosphorus is commonly the limiting nutrient in the vast majority of lake systems.

In Taupo however, the water is naturally rich in phosphorus because of the geology of the pumice soils. It is sufficiently rich that there is not enough nitrogen available to keep a ratio of 7N to 1P for every P available and so nitrogen (N) is limiting.

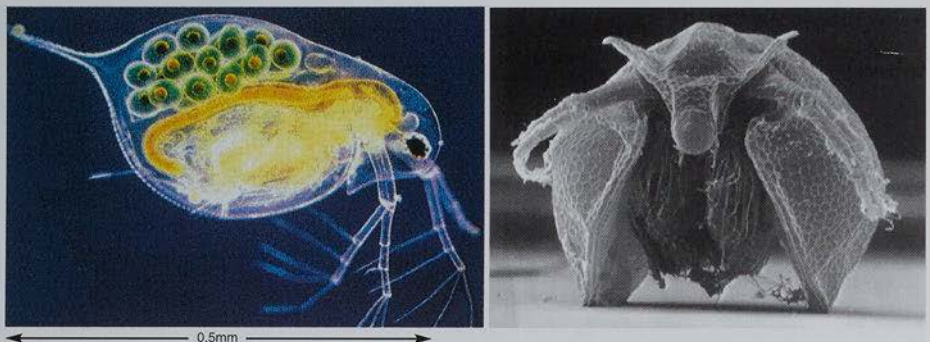
At the moment Lake Taupo has low but rising levels of nitrogen. Phytoplankton production is low simply because there isn't any more nitrogen available to allow more phytoplankton to grow. As a result, the water is clear and blue. However, as soon as more nitrogen enters the lake the production of phytoplankton will increase because as we have already discussed there is more than enough of the other nutrients present. This increase will reduce the water clarity.

The reduction in water clarity will in turn result in the reduced growth of rooted plants which also need sunlight. This loss of habitat has detrimental effects for invertebrate and fish communities. Algae can also cause large fluctuations in dissolved oxygen concentrations as they photosynthesise during daylight hours, adding oxygen to the water, but respire at night, consuming oxygen. In bloom conditions this can cause problems in the early morning when low oxygen levels can lead to invertebrate and fish deaths. Decay of algal blooms and other plants can also deoxygenate the water, killing fish and other wildlife. High concentrations of algae can affect water treatment for public supply by blocking filters and affecting the taste and odour.

There are two main types of phytoplankton; diatoms and blue-green algae. Increases of nitrogen in lakes can lead to excessive blooms of algae, the best known being potentially toxic blue-green species. However, in Lake Taupo the phytoplankton community is dominated by diatoms though blue-green blooms do occasionally occur.

Phytoplankton is used as food by small aquatic animals called zooplankton. If you like, these can be compared to rabbits feeding on plants in the terrestrial environment. Zooplankton feed close to the surface at night and descend deeper into the lake during the day. This adaptive strategy allows for zooplankton to escape predation by fish, which feed mostly by sight.

In Lake Taupo there are two main types of zooplankton which differ markedly in size. The large ones are called cladocerans and are relatively uncommon in the lake. Instead small bodied zooplankton (copepods and rotifers) dominate the zooplankton community. The large cladocerans are effective grazers of phytoplankton of which diatoms are better food for zooplankton than blue-



Zooplankton like these cladocerans feed on the phytoplankton. Note that the daphnia on the left is pregnant with 14 eggs.

green algae. If you have a lake that contains only phytoplankton and zooplankton an increase in plant productivity may not affect the water clarity. As the phytoplankton abundance increases so too will the zooplankton. In turn more zooplankton will graze more intensively and so keep the abundance of phytoplankton at a level that doesn't affect the water clarity. In other words zooplankton are the guardians of water clarity. However, lakes containing only phytoplankton and zooplankton do not exist because an abundance of zooplankton soon creates a food niche that is exploited by animals feeding on them (zooplanktivorous). In Taupo the main zooplanktivore is the smelt.

Smelt prey intensively on zooplankton especially the large ones. The presence of smelt in Lake Taupo explains why the large zooplankton (cladocerans) are uncommon: they are all eaten. As a consequence the zooplankton community in Taupo is now dominated by the small zooplankton which are not so efficient grazers of phytoplankton. If more phytoplankton are produced in Lake Taupo this will stimulate an increase in production of zooplankton which in turn will be consumed by smelt which will also increase in density. The net effect is that the phytoplankton population increases but there is not enough large zooplankton to eat them and so the water clarity declines. In essence a lake that has low clarity, for example Lake Rotorua, is simply a soup of millions and millions of small plants.

Historical records of water clarity in Lake Taupo illustrate the importance of zooplankton as controllers of water clarity. In 1935 a 20 cm white disk could be seen at a depth of 18 m in June and about 65m in January. Why did Lake Taupo have such an extraordinary water clarity in the summer of 1935?

In 1935 the abundance of plankton eating fish in the lake was probably at a minimum; trout had severely depressed the population of koaro which at this time was the only pelagic fish species in Lake Taupo. The dearth of koaro led to a dense community of zooplankton dominated by the large cladocerans. The reduction in the abundance of phytoplankton by these efficient grazers increased the water clarity to this exceptional level. However in 1935 smelt introductions

began and since smelt have established they have kept a stringent control on zooplankton and the water clarity has been limited to less than 20 metres.

We know that the quantity of smelt in Lake Taupo is limited by the amount of zooplankton that the lake can produce. The poor condition of smelt in Lake Taupo in comparison with other lakes in the central North Island and the large mortality of smelt due to starvation is clear proof of this. We anticipate that an increase in the productivity of the lake through increasing nitrogen levels may result in two scenarios for the smelt. Firstly smelt will increase in number. The other scenario is less certain. We know that most smelt do not survive spawning and die when they are about two years old. If smelt can reach greater condition through increased feeding before spawning then we expect a higher spawning survival. This in turn will result in more smelt surviving an extra year and so growing larger (10 cm). Large smelt predate on bullies 16-30 mm long and may well prey upon trout fry if these are pushed into the lake too early.

What does this mean for trout?

An increase in nitrogen will in the first instance result in an increase in smelt and a decrease in water clarity.

An increase in smelt abundance may increase the condition of the trout. If there are more smelt the trout will spend less energy to feed and so will grow quicker and fatter.

An increase in the numbers of large smelt could also cause an increase in the size of the trout. However if trout have access to larger prey they will also grow faster which may not be all good news. Fast growth can induce spawning at a younger age and thus at a smaller size.

More large smelt may also increase predation on trout fry as they enter Lake Taupo out of the rivers. Fry already have a slim chance of survival in the lake and any increase in potential predators is undesirable.

An increase in smelt density will not cause a substantial increase in the number of trout produced in the fishery. This is because the trout population in Lake Taupo is limited by the number of juvenile trout that the rivers can produce. Any change in fish numbers may occur as a consequence of kelts benefiting from the greater numbers of available smelt when they return from spawning. They may recover faster and so spawning mortality may drop. We will be able to check this hypothesis by looking at the proportion of previous spawners in the total spawning run using our fish trap data. If the trout population responds favourably to the increase in smelt density then we anticipate a larger proportion of the run comprised of fish which have already spawned at least once.

Overall any beneficial increase in smelt production will not last indefinitely. Trout rely principally on their sense of sight to hunt smelt. So if the water clarity drops to the point that the trout are not able to chase smelt efficiently the net result will be a decrease in trout condition and growth. This is why very productive lakes with low clarity often do not produce trout of large average size. For example the average size of trout

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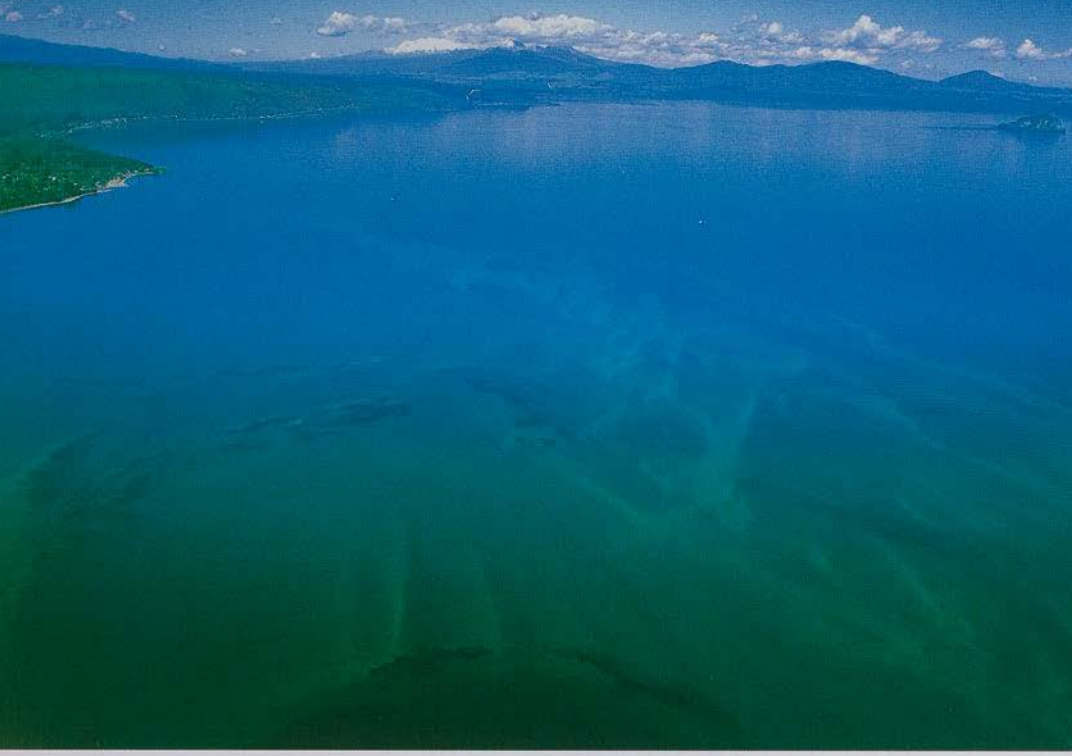
Telephone: (07) 386 8607

After hours, an answerphone message will provide you with the number of the Conservancy Duty Officer. He/she will take your call and pass on your information to the appropriate person

Note this contact number is also printed on your Taupo District fishing licence



Priceless

from Lake Rotorua is approximately the minimum legal length at Taupo. The exceptions are those lakes where the trout are sustained by huge populations of aquatic insects rather than prey fish and good visibility is less critical e.g. Lake Otamangakau.

We have seen that an increase in productivity of Lake Taupo can have short term beneficial effects on trout condition but the threats of continuing decrease in water clarity far outweigh these. Similarly a reduction in water clarity will significantly reduce the visual and aesthetic qualities of the lake and affect the whole myriad of commercial and recreational activities and perceptions based on this. We may ask ourselves; if the water clarity drops further is there anything we can do to reverse this?

What are the possible remedies?

Attempts to correct decreases in water clarity can be made at either a biological or at a water chemistry level. We call attempts at a biological level 'biomanipulation'.

Biomanipulation

Biomanipulation is the management of biological components of a lake. Two general biomanipulation approaches are used to increase zooplankton populations and so increase the grazing of the algae.

One method is to increase zooplankton populations by removing the fish preying on them. In Lake Taupo this would mean removing smelt and koaro.

The most often used method to kill fish is to use a poison called rotenone. All fish are susceptible to its impacts and a dose of 1.0 mg per litre will achieve a complete fish kill. Smelt could also be removed by intense seining. Obviously smelt removal is not an option for Lake Taupo simply because no more smelt means no more trout. It is not possible anyway. Lake Taupo has an area of 615 km2 and an average depth of about 90 metres. This equates to a volume of 55,350,000,000 cubic metres of water. Even if we could mix it efficiently, to achieve an effective concentration of rotenone would require the dumping of 55,350 tonnes of the poison in the lake! The eradication of smelt by seining would be an even more daunting task.

This is why biomanipulation is typically used only in small and shallow lakes.

I Said...

being somewhat of a

fly fishing nut I get to fish in many different and special locations both in New Zealand and overseas. Whether it be casting a dry fly at a rising trout on a river, stalking a cruising brown around a lake edge or drift fishing over a weed bed, there is nothing I like more than to fish one of the Taupo river mouths after dark.

For this type of fishing there is only one rod for me and that is the Sage 896SP. I have fished with many top quality fly rods over the years but keep coming back to my trusty 896SP. I like the medium fast action of this rod. It has power to burn but it is forgiving enough when my casting arm tires later in the evening and my cast is prone to turn to custard. The 9'6" length has its advantages when wading deep and allows me to fish a lighter tip due to the softer tip action.

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Mike Stent

Owner Fly & Gun Shop Taupo and Professional Guide.

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• Fishermans Loft – Christchurch • Centrefire Sports – Dunedin • B&B Sports – Gore

Biomanipulation tends to work well in such lakes because organisms are not spatially separated by depth. Also, nutrient levels are more static.

Another method to increase zooplankton is the direct stocking of trout in Lake Taupo. Trout stocking would increase predation of smelt and so permit zooplankton to build up. To achieve an efficient control of the smelt population would require trout to comprise 30 to 40% of the total weight of fish present in Lake Taupo. Currently the production of smelt in Lake Taupo is about 3,500 tonnes. Therefore the weight of trout required to achieve a significant impact would be approximately 1050 to 1440 tonnes. The natural production of trout in Lake Taupo is around 450 tonnes and so we would need to stock another 1000 tonnes of trout before any increase in water clarity could be expected. Here again this is clearly not a viable option for Lake Taupo. On top of the negative ecological impacts of hatchery releases the money and the facilities required to produce such a huge amount of trout does not exist and probably never will.

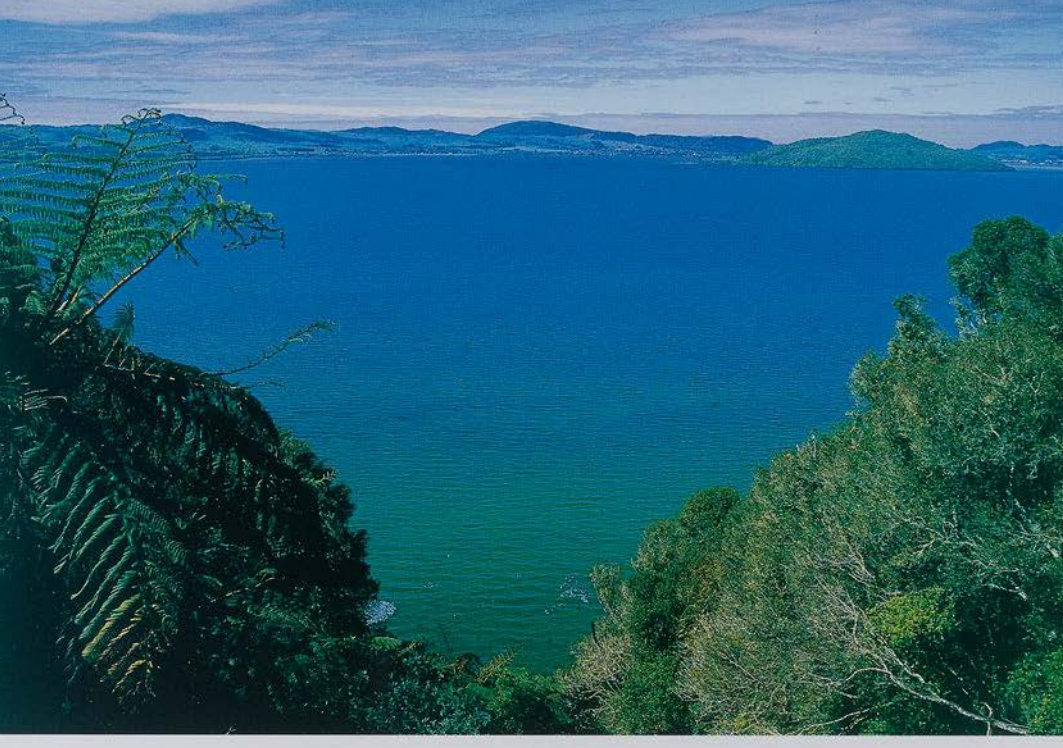
Another possibility would be to stock zooplankton in the lake. One problem is that zooplankton do not survive well in lakes where they were not present beforehand. Another requirement for the success of zooplankton stocking is a low abundance of smelt. As soon as we stock zooplankton in the lake the immediate response will be an increase in smelt numbers. To achieve an improvement in water clarity would require that we put in more zooplankton than the maximum production of smelt could eat. Clearly this is not a practical option for Lake Taupo.

A recent modification is the enhancement or construction of refuges to provide shelters for zooplankton against smelt, for example adding bundles of brush on the lake bottom. The number of bundles needed in Lake Taupo would put even the pyramid builders off.

Chemical control

Nutrient levels may be controlled through chemicals or sediment removal. For example aluminum sulfate or sodium aluminate may be added to promote phosphorous inactivation. The phosphorus reacts with the aluminum salts to form the precipitate aluminum phosphate. However nitrogen is much more difficult to remove in this way. Phosphorus is continually entering the lake from natural sources so to be effective chemical treatment would have to be carried out forever. The size of Lake Taupo means that the amount of chemicals required would cost billions of dollars and the logistics are impractical.

A major source of availability can be the release back into the water of nutrients which have collected in the lake sediments. These nutrients collect in the first instance in areas of the lake where there is no light and as a consequence no plants. Without plants to metabolise the nutrients they settle out into the sediments. This is a natural process but elevated nutrient concentrations in the water exaggerate the effect. As water clarity reduces the areas lacking plants increase and so the deposition of nutrients into the sediments increases. If at some later stage the chemical conditions change, the nutrients may be released back into the water column. This most commonly occurs if the bottom waters become anoxic (lacking in oxygen). A good example is Lake Rotorua where many millions of dollars were spent on a new sewage treatment scheme so that sewage no longer entered the lake, and



Millions of dollars have been spent trying to improve the water quality of Lake Rotorua but it is proving to be a very difficult task

on planting out the margins of small streams. As a consequence the input of nutrients is now greatly reduced but the lake water quality has not improved as much as was hoped. It appears that nutrient releases from the sediment are maintaining the nutrient levels in the water at a high level. In small shallow lakes it may be possible to remove the top layer of sediment by dredging but this example highlights just how difficult it can be to redress a problem once it has occurred.

The other option is to control the input of nutrients. For many lakes it is already too late and the damage has been done. It is very difficult if not impossible in most cases to turn the clock back but where the lake still has a very high water quality this approach can successfully maintain lake conditions. Clearly this is the most practical option for Lake Taupo.

So where to from here?

We have seen that the Taupo trout population may initially respond to the increase in nitrogen input in the lake in a desirable way. For example it is likely that the population will be slightly larger as a consequence of better post spawning survival. As for the effect on the quality of trout we can only speculate. On one hand trout condition may improve by having access to more smelt, especially larger ones, but on the other hand they may grow so quickly that they will spawn at a younger age and as a consequence be smaller when they run the rivers. The first changes in the trout fishery may already be occurring. Is it a coincidence that the average size and condition of trout in very recent years is as good as it has been at any time since the 1930s? The effects of the 1995 and 1996 Ruapehu eruptions can explain some of the changes but not all.

What we don't know is how turbid (dirty) the water has to become before it upsets the feeding behaviour of rainbow trout which are principally visual feeders. However we can't think of any turbid-lake rainbow trout fisheries where the trout are dependent on small fish for food which are a patch on Lake Taupo.

Rainbow trout are a sensitive species and the size and condition of the population reflects the quality of the habitat they are living in. Therefore a decline in the Lake Taupo trout population will be indicative of a general

Table 1: Nitrogen budget for Lake Taupo (derived from Vant and Huser 2000)

Land use	Area (km2)	Estimated N yield (kg/ha/yr)	Nitrogen load (tonnes/yr)	% of total load
Bare and tussock land	300	2	60	5
Native forest	1180	2.5	300	28
Pine forest	600	2.5	150	14
Pasture	620	5	310	29
Sewage			<10	<1
Tongariro Power Development			80	7
Rainfall			170	16
Total			1080	

decline in the health and vitality of the lake. We do know that once we reach the point where the fishery declines that in practical terms no remedy exists to restore the water clarity of Lake Taupo. Furthermore we know that for the next twenty years or so water clarity will continue to decline even if no new sources of nitrogen are permitted, and all we can do is watch.

Currently approximately 1100 tonnes of nitrogen enters the lake each year which is estimated to be a 20 to 30 percent increase over the load prior to catchment development. The nitrogen comes from the following sources (Table 1).

From table 1 it is apparent that the nitrogen yield from established pine forests (2.5kg/ha/yr) is the same as from native forest. The yield from pasture is twice as large. While fertiliser contributes a small part of this nitrogen by far the majority comes from animal urine. Discharge from community sewage schemes can have relatively high nitrogen concentrations but because the discharge is so small relative to other sources the total amount of nitrogen is less than 1% of the amount entering the lake. In contrast, the water diverted into Lake Taupo from the Western Diversions and Lake Moawhango as part of the Tongariro Power Development Scheme is of very high quality and very low nitrogen concentration. However the quantity of water is so large that the total amount of nitrogen is significant.

Obviously land owners have a right to a return from their land. In terms of protecting the water quality of Lake Taupo well planted and managed exotic forests are preferable over other farming activities. Harvesting these forests can cause a significant short term increase in the amount of nitrogen and careful logging practices are necessary to minimise this.

Farming is part of the catchment and has been for many years. As table 1 indicates farming the land does increase the nitrogen levels in the lake but a number of measures can be undertaken to reduce the impacts. Some, like the retirement of the margins of small streams from grazing, have already been adopted by many farmers. The key is that currently farming is relatively low intensity with low average stocking rates. There is however a move towards more intensive stocking, in particular the development of dairy farms.

Intensive stocking requires the application of more fertiliser and more cows will excrete more urine which will increase the nitrogen leaching from the property. For example at a

The nitrogen from pine forests is the same as from indigenous forests. In addition, carefully planted forests which protect river margins maintain other aspects of water quality

stocking rate of 2.7 cows per hectare, typical Waikato dairy areas leak about 40kg of nitrogen per hectare each year. This is eight times the current rate from pasture in the Taupo catchment. Vant and Huser (2000) predict that if between 100 and 250 km2 of sheep and beef pasture were to be converted to dairying, the nitrogen levels in the lake would increase by between 20 and 60%. This would cause water clarity to fall a further 20 to 40% down to approximately nine metres.

It is not a problem with dairy farming per se, but with any form of intensive stocking. There are measures such as keeping the cows on concrete pads during winter and collecting and disposing of the excrement which can reduce the impact but not prevent it.

Cropping can result in even greater losses of nitrogen, in the order of 200 to 300 kg/ha/yr for crops like onions and potatoes. The Taupo catchment is not suited to extensive cropping and market gardens though we note that for long enough neither was dairy farming considered a viable option.

The Tongariro Power Development provides an additional significant source of nitrogen. However studies show that this water may also have a beneficial effect on the lake which is likely to outweigh the effect of the increased nitrogen. Over summer Lake Taupo typically stratifies, that is a layer of warmer surface water develops over the cooler bottom waters. The density difference between the two layers prevents them from mixing. During this period the bottom waters therefore receive no oxygen and the existing levels are slowly depleted. Normally this is not a problem because in winter the surface waters cool and strong winds are able to mix the lake once again. However on several occasions in recent years the lake has not fully mixed as a consequence of the mild winters. If this trend is to continue and the lake not mix for several winters in a row, the bottom waters could become anoxic. This would have a huge impact on the smelt and trout populations and could cause the release of further nutrients from the sediments.

The water from the Tokaanu tailrace is cooler than the surface lake waters and plunges into the depths. This water is well saturated in oxygen and provides a key source of oxygen to the bottom waters when they are otherwise isolated. It may be that the benefits of this outweigh the additional 80 tonnes of nitrogen entering the lake.

While the amount of nitrogen from sewage disposal is low the concentration in the discharge is high. The population in Taupo and the lake shore settlements is growing very rapidly which is putting additional demands on existing facilities. Lifestyle blocks are now a popular option particularly at the northern end of the lake and it is almost impossible to quantify the discharge from sceptic tanks scattered around the lake. Concerns have also been raised recently that some boats may be discharging raw sewage directly into the lake.

Environment Waikato as the local Regional

Council have a legal mandate to manage land to protect water quality. In response to community concerns about the deterioration of Lake Taupo, Environment Waikato have issued a public discussion paper *Issues and Options for Managing Water Quality in Lake Taupo*. In this paper they raise four possible options:

1. Better water quality through reduction of nitrogen output from existing land use.
2. Current water quality involving some reduction in nitrogen output from existing sources.
3. Slightly lower water quality by maintaining status quo land use.
4. Lower water quality by doing nothing.

Options 1 to 3 would prevent any further intensification of land use.

Essentially there are two courses: we can do nothing in which case the decline in water quality is inevitable. Or, as a community, we can shoulder a collective responsibility to minimise the input of nitrogen.

Carry your fishing licence with you at all times when you are fishing

Taupo is all about a clean clear lake. Whether your interest is in fishing or boating or swimming or making your living as part of the infrastructure supported by the lake or simply living beside such a great environment, the lake is part of everyone's life. While we don't know the lake's total worth to the area, the fishery alone generates over 100 million dollars a year to the local and regional economy. Both of the authors have travelled extensively around the world and we are well aware just how unique this lake is. For example in the United Kingdom only a very few lakes meet their highest water clarity standards, that is the clarity exceeds five metres. Taupo doesn't need any gimmicks, it is just a case of looking after what is already here and reaping the benefits as more and more people pay to experience what we take for granted.

As unpalatable as it is to some, the reality is that this is where the value is in this catchment. If we have to make a choice, and we do, it has to be to look after the lake.

So the do nothing option is simply not an option. Water quality will continue to decline because of the lag time between the cause and the nutrient rich water entering Lake Taupo. As we have discussed there are a number of existing sources of nitrogen which contribute to the current situation. Clearly whatever else is done, no new activities which exacerbate the problem should be permitted. At the moment publicity focuses on the potential to convert drystock and sheep farms into dairy farms. However this is not the only issue; for example over 40 new subdivisions are in the wind in the Taupo area.

This approach raises some very hard questions with no easy answers. For example if

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More and more people want to live close to the lake but issues such as sewage disposal require careful planning to ensure no increase in nitrogen in the groundwater

land values fall because intensive use is prohibited who should bear the cost? Is there a loss of value if the land use is not sustainable?

We suggest there has to be a two pronged approach. In the first instance further intensive land use should not be permitted unless it can be demonstrated to have zero impact on groundwater nitrogen levels. Furthermore it is not up to the community to demonstrate that it will have an effect, the applicant must show it will not. It is not a case that a little increase will be okay, it either has no additional effect or you don't do it.

Secondly, we have to look at minimising existing inputs where practical. This shouldn't pose a threat to existing activities but there are ways of modifying the effect of some of these. In some cases there will be costs associated with making these changes which shouldn't necessarily fall on the landowner. As a community we have to work out solutions which must involve equitably sharing the burden.

There are some debates at present regarding whether particular activities contribute to the problem and if so by how much. One way or another we all have to contribute whether it is by paying additional rates to assist funding the solutions, by putting in efficient but more costly sewage disposal designs on our 10 acre blocks, putting in a holding tank on our boat, supporting local councils to upgrade sewage treatment systems, by not converting to dairying and so on.

We either pay now or in a much bigger way later on. At least we have a choice. Nothing is more certain than in 20 years time when our kids stand by the lake it will be too late for them to choose. The lake will be in worse condition than it is now but it will still be a special lake. The question will be whether they will know that it is not going to get any worse (maybe even better) or that it is lost because of what has happened in the intervening 20 years.

Reference:

B Vant and B Huser, 2000: Effects of intensifying catchment land-use on the water quality of Lake Taupo. *In Proceedings of the New Zealand Society of Animal Production:* 60: 261-264

Taupo Fishery Advisory Committee Representatives

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John Gibbs	Department of Conservation Telephone (07) 386 9228 or email jgibbs@doc.govt.nz

The Tuwharetoa Maori Trust Board also have a representative on the committee

Rockin' on at the National Trout Centre

by Maureen Smith

The Kaupapa Wahine group of the Department of Conservation (Tongariro-Taupo Conservancy) fronted up at the Tongariro National Trout Centre on 20 September to construct a rock wall as part of the newly opened area at the northern end of the complex past the children's fishing pond. The group, ably guided by Gordon Hydes, made concrete, selected and carted rocks, poured concrete and assembled the first layer of the wall. What a labour intensive task this rock wall stuff is!! Luckily we had a classy selection of workers to choose from.

The rock wall is part of a larger project, which is being overseen by Kaupapa Wahine, to beautify and revegetate this previously unused area of the trout centre. The KW group is grateful to the Taupo Fishery Area for the opportunity to gain considerable skills in what are new areas for some of our group. Tasks include organic weed spraying, track realignment, rockwalling, creating interpretive material for the electric fishing counter and the fish trap and revegetating the area with native plants.

The wider goal of Kaupapa Wahine nationwide is to encourage women to become more involved in conservation, and we welcome any women from the community to our monthly work projects. This year the focus is on the Tongariro National Trout Centre but future projects could involve areas further afield than Turangi, perhaps Taupo or Ruapehu.

From left to right: Barbara Wright, Anja Hambach, Kylie Laxton-Blinkhorne, Kerry Smytheman and Julie Twigden begin constructing a rock wall at the Tongariro National Trout Centre


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Monitoring Juvenile Trout

by Rob Hood

Rob is one of Taupo Fishery Area field staff which special responsibility for the day to day running of the 2000/01 harvest survey

"You use electric fishing machines? – that's shocking!" Excuse the pun, but that is often the reaction of people when they find out that as part of our juvenile trout monitoring programme we use electric fishing machines (EFMs).

The Taupo trout population is self-sustaining, relying on the young fish produced from all the spawning which occurs in the rivers each winter. We closely monitor the production and survival of juvenile trout, which can be affected by many factors, such as the suitability and amount of habitat available, barriers to fish passage and floods, just to name a few. While the majority of juvenile trout emerge from the redds (where the eggs are laid in the gravels) from September to November, they spend up to 18 months rearing in the rivers and it is important to monitor them throughout the year and from year to year, to identify any trends and changes in the populations.

The Department of Conservation uses two methods of fishing each month to sample the juvenile trout in the Tongariro River and Whitikau Stream (the main spawning tributary of the Tongariro). Fingerlings (trout 100-200mm) which prefer more cover and debris and slightly deeper water than fry and parr are caught using Gee minnow traps. These traps, which are like the plastic "bait catchers" used by kids to catch sprats, are baited with trout roe and six traps are set at each of four different sites. The following morning the traps are checked, any trout anaesthetised, and information on species

NIWA Instructor Marty Bonnet demonstrates the use of portable electric fishing machines, like the two in the foreground

Taupo Fishery Area staff member Rob Hood (left) and Chris McMillan put their training into practice

and length is recorded before the fish are released unharmed.

To catch fry, which prefer shallower stretches of river edge around boulders and cobble riffles, the EFM is used. Five sites spread along the length of the Tongariro and the Whitikau are sampled each month. The EFM creates an electric field in the water that interferes with the central nervous system of the trout. This causes a reaction known as "forced swimming" in the trout, which swim towards the electrode held by the EFM operator. This allows the trout to be scooped up in a hand net and processed in the same way as for minnow traps. As soon as the fish is removed from the electric field it recovers immediately. The EFM has several built-in safety features to protect the operator and crew. To operate the EFM staff are required by law to hold an operator's certificate which requires attending and passing a training course.

Recently, Conservation Officers Chris McMillan and Rob Hood attended a three day electric fishing course held in the Waihi area. Instructor Marty Bonnett from National Institute of Water and Atmospheric Research (NIWA), Christchurch, provided a comprehensive and sometimes entertaining combination of theoretical and practical information and expertise. The main aspect of the course was to learn how to safely and efficiently use EFM equipment. It was also a great opportunity to catch species that are not seen in Taupo waters, including several galaxiid (whitebait) species. (Koaro or Galaxias brevipinnis occur at Taupo in surprisingly large numbers).

The results of this year's monitoring show that the numbers of juveniles caught were high until October, when it appears the two floods had a significant effect. These spring floods are a part of the natural cycle of rivers. A similar decrease occurred immediately after the large floods in 1998, after which numbers of juveniles remained low for several months but eventually recovered and peaked later in the year at a number similar to the previous year. We will continue to monitor the affects of the flood but it is expected that the progeny of late spawning fish will once again enable the juvenile population to recover. Monitoring of spawner numbers in early November certainly indicated a large number of spawning fish still in the tributaries.

Spring/Summer Hunting Prospects

by Cam Speedy

Cam co-ordinates animal pest and threatened species management for the Tongariro-Taupo Conservancy. Cam and his team also oversee weed management and habitat monitoring

As summer fast approaches and our local deer kick out of their winter mode to take advantage of the growing season, deer hunters from all around the North Island are starting to once again focus their attention on the central high country. Permit issues have been very steady for the new permit period, which began 1 November 2000. So what can hunters expect this summer?

Obviously there will be less red deer on the Kaimanawa and Tongariro National Park tops this summer following a five month helicopter deer recovery period between June and October. Seven helicopters were authorised to hunt Kaimanawa Forest Park outside of the recreational hunting area (although two of these crashed in August), while two companies were authorised to hunt the Hauhangatahi Wilderness Area and the slopes of Mount Tongariro.

Table 1 details the harvest taken by the six helicopters that have so far returned information. A total of 217 deer were recovered with an average recovery rate of 2.55 deer per hour. As predicted, the harvest was dominated by red deer from the more open habitats while sika deer made up a relatively small proportion of the take (62 of the 217), despite the fact that sika are now the dominant deer species throughout much of the central North Island high country. This is due to their smaller carcass weights and preference for heavy forest or scrub cover where most forms of hunting, including helicopter recovery, are less effective. The selective removal of red deer under the current regime is likely to see sika become even more dominant in years to come.

Recovery operations are now suspended until 1 June 2001 and those deer who have managed to escape the helicopter "season" will now start to move back into the open where the best food is to be found and where ground hunters can more easily get at them. However, Manaaki Whenua – Landcare Research Ltd. on behalf of the Animal Health Board, has requested permission to take a further 30 carcasses for autopsy from the Waimarino/Waiotaka/Whitikau catchments during December as part of their investigations into the incidence of bovine Tb in wild deer following successful possum control. This will involve a single helicopter undertaking approximately six mid-week recovery runs prior to Christmas between the Waimarino River and Kaimanawa Road in the north-western Kaimanawa Forest Park. Everywhere else most deer should be well settled back into feeding patterns which are not influenced by helicopter activity by December.

Areas such as the Waipakihi Valley, the heavily forested northern catchments between Kiko Road and Clements Road and the recreational hunting area, especially Jap Creek and the Upper Kaipo, will all produce well for sika hunters after a couple of good growing seasons, followed by reasonably mild winters. These areas have had virtually no attention from the helicopter operators. Fawn survival is likely to have been above average again this winter meaning plenty of yearlings over summer. Please remember however, that the taking of a breeding hind has the greatest impact in sustaining the health and productivity of habitat. If given a choice – take a mature hind!

Two very large sika stags were taken from the Oamaru Hut/Kaipo River area this winter. Both 8 pointers with Douglas Scores

Table 1:
Summary of helicopter deer recovery in Tongariro/Taupo Conservancy, winter 2000

Area Subject to Animal Recovery	Total Red Deer Recovered	Total Sika Deer Recovered
Part Kaimanawa Forest Park	126	51
Part Tongariro National Park	23	-
Rangitaiki Forest Conservation Area	6	11
Totals	155	62

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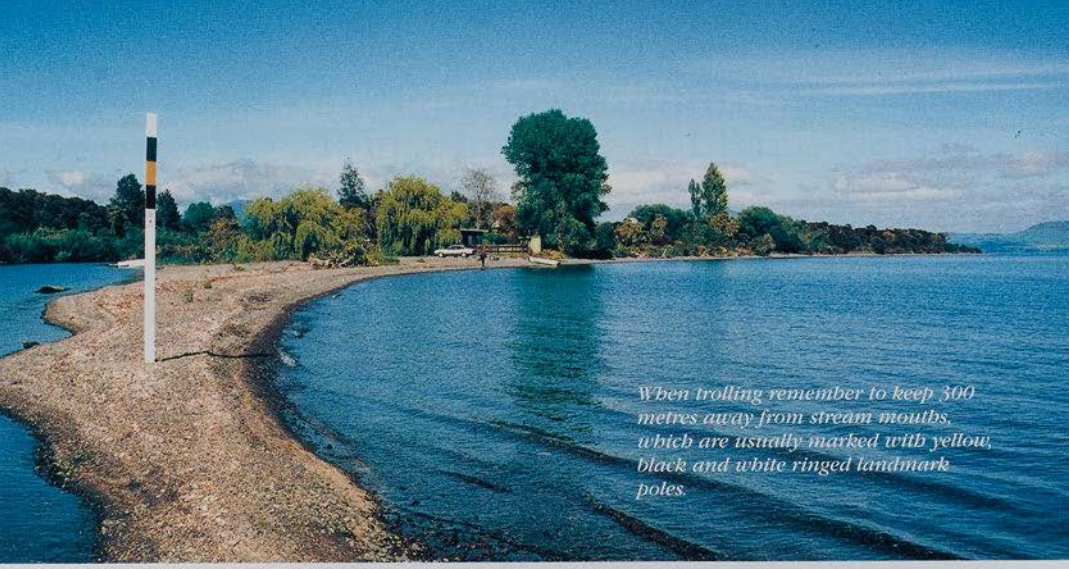
of around 207 and 196 points respectively, these stags are an indication of what hunters can expect to find in these areas. However, if you are hunting this area over the November to March period be aware that a major possum control operation is to occur along a 3km buffer against the Poronui Station boundary this year. The ground-based control operation is part of the Animal Health Board's East Taupo Vector Control Area which covers some 150,000ha from Mohaka to Reporoa. The Kaimanawa part of the operation will utilise mostly cyanide in paste or encapsulated pellet forms. A crew of six hunters will be working in the area for extended periods. Please ensure you take care to clearly identify your target and beware of the presence of hand-laid toxins over an extensive area east of the Kaipo River, between Oamaru Hut and Clements Road.

A helicopter lifts off with a load of red deer destined for the dining tables of Europe

A total of nine hunting parties have taken the opportunity to again utilise helicopter access opportunity into the Rangitikei Remote Experience Zone this spring. Access opens on the 4 November for eight weeks. The Whakamarumaru Tops site has been as popular as ever this year with all opportunities taken, despite the fact that winter helicopter harvest is likely to reduce the opportunities for red deer at this location this spring. One very pleasing trend is the decreasing impact that helicopter access for hunters is having at landing sites. It would appear that hunters are finally getting the message about "taking only venison and leaving only footprints". Let us hope this very positive trend continues!

Tongariro Forest was not subject to aerial harvest over the winter period and as spring has kicked on in this very popular and accessible hunting area, local hunters especially have enjoyed good results with plenty of well-conditioned deer available for the freezer. Tongariro Forest has seen significant benefits in the last few years from effective possum and goat control. This is reflected in the health and condition of the forest and its wildlife. Hunters are encouraged to contribute to the ongoing recovery of this very important protected area by keeping the red deer numbers low. Again, harvesting breeding hinds is the key to achieving this.

All in all this summer promises to be reasonably productive. Please take care with fire and remember to remove ALL your rubbish. We trust that you have a safe and enjoyable summer and look forward to receiving your feedback.



When trolling remember to keep 300 metres away from stream mouths, which are usually marked with yellow, black and white ringed landmark poles.

More Summer Angling Seminars Scheduled

During January 2000 we held two seminars aimed at providing beginner or holiday anglers with tips to increase their success and enjoyment fishing the lake. Two hundred and fifty people attended the seminars held at Omori boat ramp at the southern end of the lake, and at Wharewaka Point in the north. From the feedback we received it appears as though people got a lot out of the seminars, so we have decided to run them again this season.

This time the venues have been changed to Kinloch Marina and the Motuoapa Motor Camp. The seminars will be presented by fishery staff and will include discussions and demonstrations about suitable trolling, downrigging and harling equipment and techniques. We will explain how to get the most out of your depth sounder, and why you find fish in some places and not others. We will illustrate the best way to release unwanted fish and also the best way to care for those fish you do keep.

No bookings are required, simply turn up to either the Kinloch Marina on 4 January or Motuoapa Motor Camp on 6 January at 10 a.m. for a two-hour discussion about fishing. Bring a chair or something comfortable to sit on. We'll see you there!

"It Beats Working"

by Harry Hamilton

In September, Solid Gold FM radio station ran a competition, where each day for a week they picked a telephone number at random from anywhere in New Zealand, the prizes, all expenses paid trips for two to the Kingdom of Tonga. Fisheries team member Harry and his wife Gloria who live in Turangi were among the very lucky winners.

The trip involved a four-day cruise around the Vava'u group of islands on the cruise ship M.V. Oleanda. We arrived at Nuku'alofa international and domestic airport on Friday, 13 October – yes, "Black Friday." From Nuku'alofa it was on to the Vava'u Islands where we were met by our Cruise Director, Wayne Fox. Once all the formal arrangements were sorted out we drove to the port of Neiafu where we boarded the ship and were introduced to the captain and crew.

The first night out we sheltered between two islands and had our first night of entertainment known as the "Island Whispers". As you can imagine everything was provided, including a punchbowl with fresh fruit and red wine – very nice!! Included in the dinner menu was a local food "Lupalu" consisting of ground beef and coconut cream wrapped in green leaves.

Breakfast was served between 6.30 and 9.30 a.m. and again lashings of fresh fruit, including watermelon, pineapple, bananas, etc.

Harry (centre in the blue shirt) and Gloria (sitting second from the left) join other prize winners and the crew of "Oleanda"

We headed further out to sea, island hopping and stopping at many different islands to go swimming and snorkeling. One island we stopped at is called "Swallows' Cave", so-called because it's full of nesting swallows. The cave itself was huge and can accommodate a boat inside it. The water is around 50 metres deep inside the cave and it was amazing to see all the small fish swimming around the lovely coral reefs.

The highlight of the tour for me was the whale watching. Very excited passengers had the opportunity to view five humpback whales in all, including one calf. I had never seen whales this close before. We also visited "Blue Lagoon" with its very blue, clear water and were invited to have dinner with the German owner and his Tongan wife.

Once the cruise was over we stayed at Marcella Resort for three days. A very quiet and relaxing time after the noise on board the cruise vessel, apart from a rooster who decided at two or three o'clock in the morning to start his daily crowing!

We would certainly recommend Tonga to anyone thinking of going for a relaxing holiday. The Tongan people are wonderful and nothing is too much trouble for them.

Harry tries the traditional drink of kava

Angler Access through the Tongariro National Trout Centre

Anglers can get to the Birch and Silly pools on the Tongariro River at any time via a track from the car park at the northern end of the Tongariro National Trout Centre property (see issues 31 and 34 of *Target Taupo*). The car park which is adjacent to State Highway One is signposted. The track leads down to and across the Waihukahuka Stream and on to the river walk along the left bank of the Tongariro.

A sign by the Upper Birch Pool directs anglers from the river walk and along the river bank, over the river bed to the Silly Pool. From the Silly we have made a track up over the hill and around to the upstream end. You can walk on through to the Red Hut car park if you wish, or return downstream.

For anglers who like to be dropped at one car park and picked up an another, this is a shorter route than the one on the opposite bank between Red Hut and Major Jones bridges. You can fish eight pools and runs between the Red Hut bridge and the top of the Cattle Rustlers Pool.

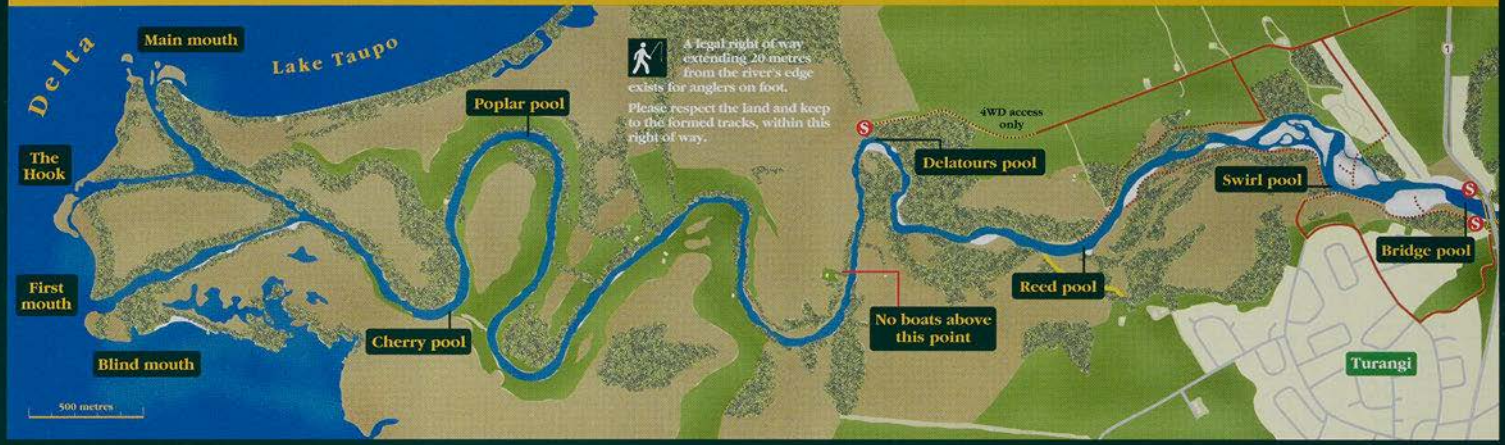
As explained in earlier issues, our wish is to continue to provide fishing access at all hours but to separate it from present and proposed visitor development of the centre from our workshop and from staff quarters areas. Now there is access along the river to the Silly Pool and over the hill, we have blocked off tracks formed by anglers taking shortcuts through the grounds of the centre. After hours and unauthorised visitors are unwelcome and are gently reminded of the trespass laws.

Criticism has been levelled about the stream crossing at the downstream end of the fish trap in the Waihukahuka Stream. We have made steps with large rocks up and down the banks but the stream must be waded. For anglers in waders this is obviously not a problem but it discourages other users from using the track to access the trout centre grounds.

Department of Conservation
Te Papa Atawhai

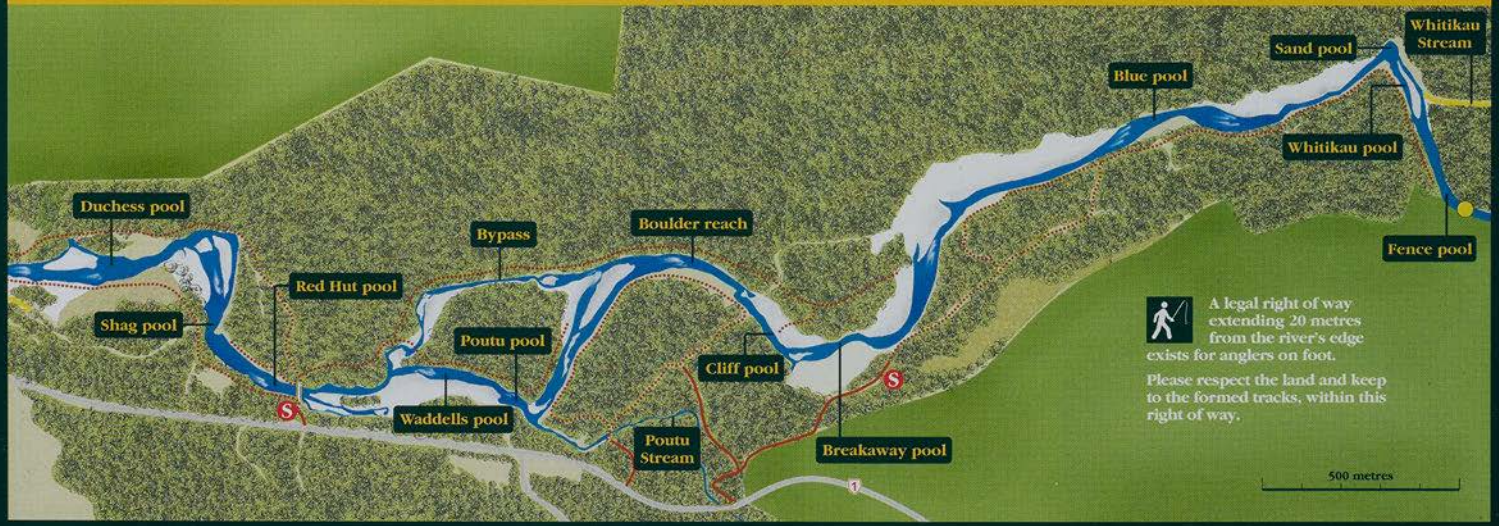
Tongariro River

Lower River



Middle River

Upper River



Foot Access
Vehicle Access
No fishing at any time
No fishing above this point between 31 May and 1 December
Fishing Sign Location

For further information phone Taupo Fishery Area 07 386 8607

The "hole" off the Tokaanu tailrace is a popular fishing spot. Research by NIWA indicates that a current of 15 to 20cm per second flows out of the tailrace, across to the left hand edge of the hole and on around the drop off to the Delta.

Slabs or Saviours?

by Michel Dedual and John Gibbs

John Gibbs is the Taupo Fishery Area Manager. He has fished Lake Taupo since the 1950s and his working involvement with fishery management goes back to 1964.

In New Zealand, trout that have survived the rigours of spawning but not recovered condition are often called "slabs". Taupo anglers used to eating prime maiden fish generally don't consider slabs as very desirable to bring home. However, comparing these trout to a flat piece of wood is somewhat harsh considering what these fish have gone through to perpetuate the species and consequently allow us to pursue our favourite leisure.

We often get anglers asking what they should do with slabs. Knock them on the head and save food for the younger trout, or put them back in the water in the hope that they will survive and recover condition? It is commonly thought that slabs will die anyway so are they best taken home and buried under the tomatoes?

Knock them on the head and save food for the younger trout, or put them back in the water in the hope that they will survive and recover condition?

A typical Taupo kelt. The stresses of spawning take toll on the condition and appearance of the fish

Fishery biologists around the world use the term "kelt" to describe Atlantic salmon or sea trout that have spawned. The term is also commonly used in New Zealand to describe brown and rainbow trout and in this article we will refer to kelts rather than slabs. We will present some facts about kelts and the key role they play in the Taupo fishery.

To be successful a fish species must perpetuate. To fail is to become extinct. In this sense both abundant and relatively rare species can be considered successful. Equally, success can be achieved by a wide variety of life history strategies. Success is associated with the ability to withstand adversity which can only be achieved if a population has some growth potential. Fishing exploits this growth potential and sustainable harvest is synonymous with surplus production. Stocks which have little potential to overcome adversity yield only small surpluses of production and similarly a high potential leads to a larger surplus. The understanding of strategies used for survival and their implication for population growth can offer guidance to fishery managers seeking to exploit fish stocks.

The ideal fish would have a long life, reach maturity at an early age, then reproduce often producing many young each time. But there are constraints that limit the capacity of fish to do this. A concept central to the development of life-history theory is that of trade-off constraints. Fish live in a finite world. An increase in the time or resources invested in one activity must be traded off against a decrease in the time or resources

invested in other activities. For example, the cost of a current breeding attempt may be a reduction in survival, growth or future fecundity (number of eggs produced).

A second constraint is that reproductive traits have to be compatible with other adaptations of the fish, such as those related to swimming. For example, fecundity can be increased by diminishing the size of the eggs or by increasing the volume of the body cavity to accommodate more eggs. A reduction in the size of the eggs will probably lead to an increase in embryo mortality, counteracting any benefit. An increase in body cavity volume would require a change in body shape but physical factors impose constraints on body shape in relation to swimming.

The costs of reproduction

Once up-river migration and associated fasting commence, a trout has a fixed store of energy reserves. Its weight diminishes en route as fat, which is the major fuel, is used up. When the fats are largely depleted, then protein provides most energy. The body shrinks, first by losing the fat surrounding the digestive tract. When this fat reserve is exhausted the fish then uses in sequence fat stored in the belly flap, between both fillets along the back and inside the muscles. Compensating for this weight change, water concentration increases and forms a progressively greater proportion of the body weight, serving in part to preserve body shape. At the same time the gonads are maturing or have reached maturity. In the case of ovaries this draws on a significant fraction of the fat reserves and the flesh colour turns from bright orange to white (see *Target Taupo* issue 31).

Data recorded in New Zealand and overseas shows that trout lose between 20% and 40% of their weight during the three months they spend spawning. We have observed during our radio-tracking experiment in the Tongariro River that females generally behave differently from males during breeding. Females move steadily upstream to their spawning ground where they wait for their eggs to undergo the final stage of maturation. The actual deposition of eggs lasts for only a few days after which the fish resumes feeding in the river to regain condition or returns back to the lake. On the other hand, males will stay on the spawning grounds for weeks or even months courting a number of females and chasing other pretenders until completely exhausted. The net result is that males suffer as much as and sometimes greater weight loss than females. Clearly, spawning imposes an extremely severe stress on trout, though it is not always fatal unlike most of the closely related Pacific salmon species. However, the chances of survival may still be slim. Several factors operate against complete weight recovery and survival after spawning.

Post-spawning fish have only very limited reserves of energy available for hunting and consuming food. Our measurements of stress and exhaustion following capture show that when hooked and played kelts don't show such marked stress as fish that haven't spawned. This suggests that kelts are simply too tired to put up a significant fight. It has been observed in other fish species that after a period of starvation they accept food readily, but much of the food is found undigested in the resultant faeces. Also the general observation that the ratio of live weight gain to food intake falls with age is presumably applicable to fish as well as to domestic animals. It is not unexpected

therefore that only in very favourable environments will trout survive for long after the severe test imposed by spawning. Studies on populations of salmonids at high latitudes suggest that it can take two years or more for Arctic charr to recover sufficiently from spawning to spawn again. There is also evidence that spawning is more demanding on large fish than on small fish. The largest fish are unable to restore the energy reserves sufficient for another attempt at reproduction.

For a trout that has survived spawning and returned to the lake the recovery process begins. The fish will gradually lose the dark and dull reddish colouration acquired during maturity and return to a silvery colour typical of a lake-dwelling trout. The silvery colour is an adaptation to help the fish to be less visible to its prey especially when stalking close to the water surface.

The reappearance of bright orange flesh colour will depend upon the type of prey eaten (see *Target Taupo* issue 31). The more the trout prey on animals rich in bright orange pigment like koura or smelt that have fed on plankton the faster their flesh will become orange. However if the fish feeds on smelt that are spawning along the edges of the lake or other prey that are not so rich in pigment then, even though in good condition, the trout will not regain the sought-after orange coloured flesh.

As a trout regains condition and strength it will store fat to restart maturation of the gonads. When the conditions are good it will store as much fat as possible to give the best chance of successfully spawning again. A fish that has reached this stage can be very difficult to distinguish from a maiden fish.

The feeding conditions in Lake Taupo are so good that if kelts survive the summer they have every chance of regaining body condition to match maiden trout.

Abundance of kelts

The number or more exactly the proportion of kelts in the catch and in the spawning runs will depend on how many kelts survive spawning and the recruitment of younger maiden fish.

Canadian studies have shown that post-spawning survival is related to the flow conditions that occur in the streams following spawning. Kelts need small floods to stimulate their downstream migration to the rich feeding grounds in the lake. This downstream migration is very passive and without small floods the kelts simply remain holding in the less favourable habitat of their spawning stream. We anticipate that a wet spring with frequent small floods such such as has occurred this year will produce more surviving kelts than dry, low flow conditions.

Post-spawning survival in Taupo trout is substantial and is higher for brown trout than for rainbows. It is also slightly better for females than for males of both species. Typically, approximately 30% of rainbow trout survive to spawn again.

It is important to remember that the number of kelts in a spawning run in any given year will be related to conditions in the stream the year before and to

rivers respectively were previous spawners.

A kelt is easily recognised by its spawning scars and generally poor condition when caught in the lake during spring and early summer. But by late summer and autumn the signs are much less obvious. The skin colour and condition will be very similar to those of a maiden fish. The only external signs are slightly more ragged fin edges especially on the caudal and anal fins, exaggerated head proportions in males and an enlarged vent in females.

Internally, a sure sign in females is the dark remains of eggs unspawned the previous year. Males may show some enlargement of the testes but this is hard to detect. Flesh colour is not such a good indicator of the reproductive status of the fish because it will depend on the type of food eaten. You can find previous spawners with bright orange flesh and maidens with relatively pale flesh. The

River mouths are a favoured feeding areas for trout attempting to regain condition. As a consequence kelts are a common catch of river mouth and harling anglers during spring and summer

Photographs: Len Birch

feeding conditions in the lake the past year. So the year 2001 previous spawner run will be dependent on events last winter (2000) in the river and from mid-spring 2000 to early autumn 2001 in the lake.

Role of kelts in the Taupo angler's bag

The importance of kelts in the Taupo fishery is far from negligible. If we look at our harvest survey data for 1998 and 1999, 31% and 32% of trout kept from the lake and the feeding conditions in Lake Taupo are so good that if kelts survive the summer they have every chance of regaining body condition to match maiden trout.

So even though maiden fish are the most sought after trout, a substantial proportion of the fish caught in Taupo are kelts. From an angling perspective a good number of harvestable previous spawners is a good sign rather than a reflection of a poor year! Anglers' concerns that kelts compete with maiden fish for food may have been justified during times of very high trout numbers in

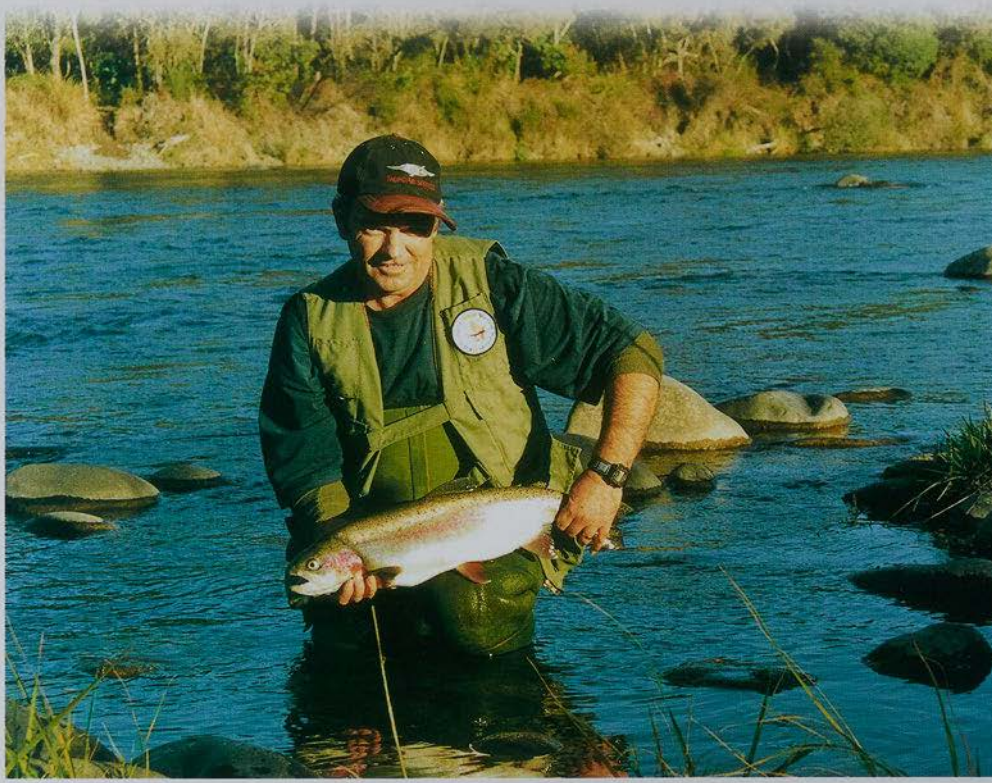
the distant past. However the level of harvest from the Taupo fishery since the mid-1980s combined with reduced recruitment of juvenile trout to Lake Taupo reduces the likelihood of this competition. Indeed one indication of over-harvest is a very low proportion of repeat spawners because the chances of a fish surviving two years in the lake and not being caught are almost nil. During the period of excessive harvest in 1989 and 1990 less than 10% of the spawning run were previous spawners.

There are also other features of kelts that are beneficial to the Taupo fishery. Our radio tracking experiment indicated a difference in migration behaviour between maiden trout and previous spawners in the Tongariro River. Maidens moved erratically to the spawning grounds, making bursts of fast upstream movements. Previous spawners on the other hand moved more consistently by making slower but more frequent upstream progress. The probable reason is that maiden fish are lacking spawning experience and knowledge of the river. Migration and breeding is a more familiar experience for kelts.

Even the timing of spawning may become routine for previous spawners. Some females returning to spawn in the Waihukahuka (hatchery) stream for a second time were caught in the trap on almost the same day as the previous year. The mechanisms behind this amazing precision are totally unknown. It would also be interesting to know if maiden and previous spawners of similar weight produce the same number of eggs.

The key point to remember is that maiden fish are the progeny of parents who spawned three years before. We know that trout are particularly vulnerable to adverse environmental conditions during the early stages of

By the end of summer it can be difficult to distinguish a fish which has spawned the previous winter from a maiden fish. Fishery Area Field Operations Programme Manager Rob McLay with a previous spawner in the Tongariro River



their life. The number of maiden fish in the spawning stock is related to the environmental conditions experienced three years before the actual run. Now we can imagine the consequences on the size of the spawning run from a year with large spring floods, severe summer droughts or major volcanic eruptions. Fortunately the previous spawners, being a year or two older and not having been affected by those particular conditions, will become a major component in the spawning stock, ensuring sustainability of the fishery.

Conclusion

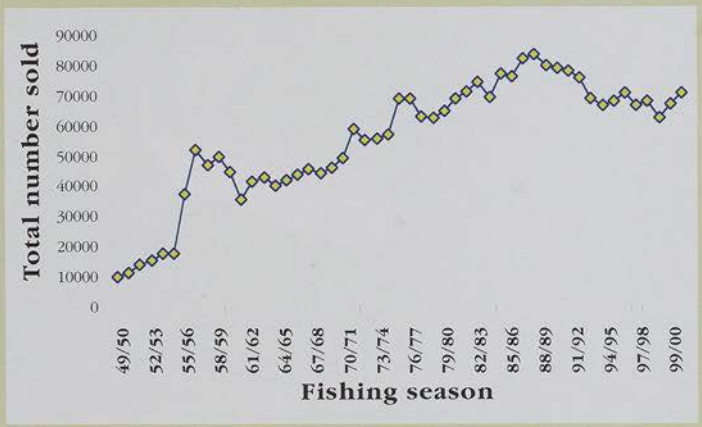
It is easy to answer the question "Should I release this skinny kelt or just knock it on the head to save food?". Firstly, if handled carefully it has a good chance of surviving and recovering condition to provide a later angler with an acceptable eating fish. Secondly, if it survives to spawn again it becomes an important safeguard to protect the fishery against the vagaries of nature. Let them go.

Fishing Licence Sales

There was an increase in licence sales for the 1999/2000 season of 3,463 or 5%.
Total licences sales for the last year are shown below compared with the previous year

Category	1999/2000	1998/1999
Adult Season	13,214	12,571
Child Season	5,624	5369
Adult Month	1114	970
Adult Week	10,293	11,051
Adult Day	32,964	30,394
Child Day	7428	6819
Total Sales	70,637	67,274

Sales for the first four months of this season, 2000/2001, are also up by 9% compared to the previous season.
However numbers are significantly still less than the peak of 82,000 in 1986/87 shown in the graph below.



Total Taupo Fishing District licence sales 1949/50 to 1999/2000

Review of the Taupo Fishing Regulations

The Taupo Fishing Regulations 1984 are created pursuant to Section 14 of the Maori Land Amendment and Maori Land Claims Adjustment Act 1926, and Section 48A of the Conservation Act 1987.

The last major review of these regulations occurred when the current version was written in 1984. This is 16 years ago and a lot has changed in this time. We are aware some regulations have outlived their usefulness and it seems an appropriate time to review all of the regulations.

We will be discussing possible changes with the Taupo Fishery Advisory Committee. Many anglers have strong opinions about the value or not of some of the current regulations. If you wish to make some comment please write to either the Taupo Fishery Area Manager, Department of Conservation, Private Bag, Turangi or to your representatives on the Taupo Fishery Advisory Committee. Their contact addresses are given on page 17.

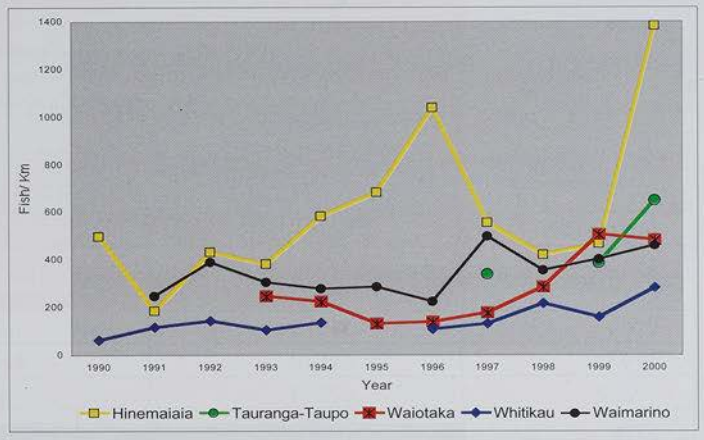
A Memorable Winter on Taupo Rivers

This winter has been characterised by many reports from anglers of excellent results fishing the Taupo rivers. Our data collected from angler interviews and from trapping the spawning run in the Waipa stream confirms that this has been one of the best seasons in recent years for numbers of fish running and numbers of fish caught.

The number of trout trapped in the Waipa, a tributary of the Tongariro River, is almost double that for the same period last year. Monthly drive dive counts of trout in the Whitikau, Waiotaka, Waimarino, Tauranga-Taupo and Hinemaiaia rivers are among the highest recorded since these surveys began ten years ago.

Graph 1:

Peak spawning densities measured on five Taupo tributaries, 1990 to 2000



Louis de Bievre fishing the Rangers Pool on the Tauranga-Taupo. This river provided exceptional fishing this winter.

As a consequence of the number of fish present, anglers have enjoyed high catch rates with all rivers producing the goods throughout the season. In particular, our data indicates that the Tauranga-Taupo and Hinemaiaia rivers have provided exceptional fishing. Comment from Waimarino regulars suggests that this river has also provided outstanding results.

The fishing came on with a bang following a dray autumn. The early season catches were so spectacular that many anglers concluded that the runs had come early and therefore the season might be a short one. The timing of the runs in fact followed the normal pattern with numbers building to a peak in September. This is demonstrated clearly by looking at monthly totals from the Waipa trap:

Table 1:

Monthly trout runs through the Waipa trap this year.

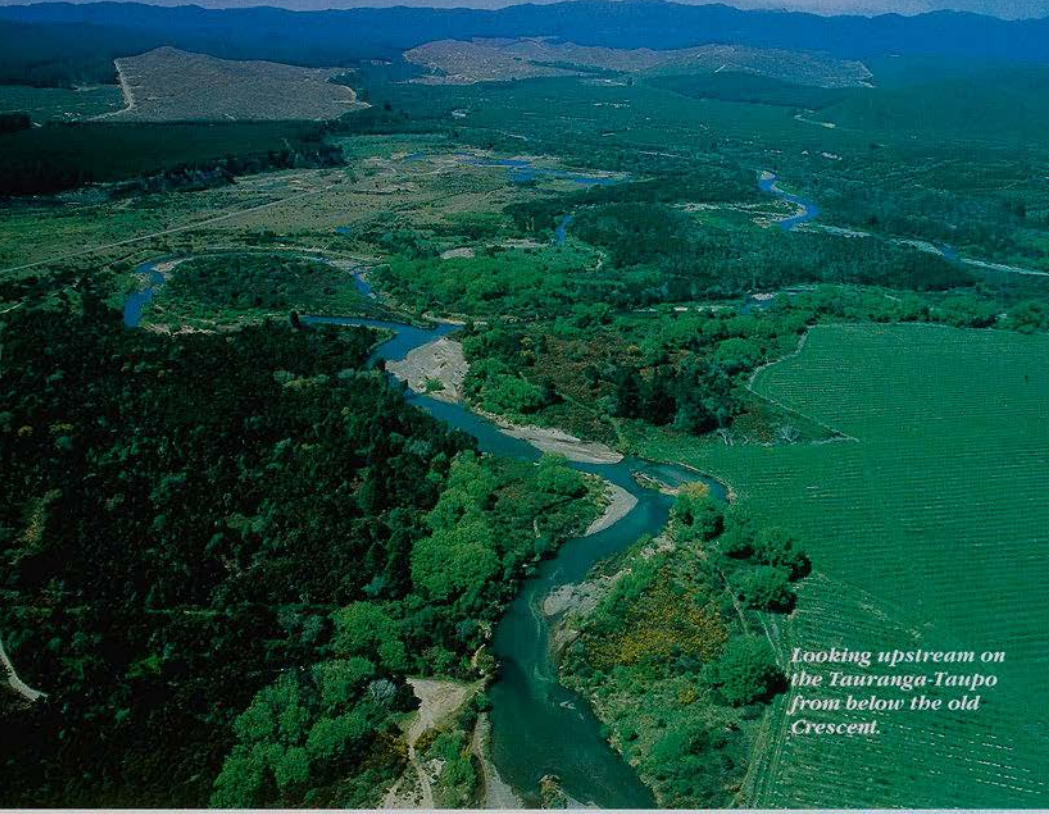
March	April	May	June	July	August	September	October
41	382	338	498	957	988	1435	403

It is interesting to note in table 1 that the October run is comparable with the early season numbers. As a consequence, the latter part of the season is still affording excellent river fishing opportunities with the added bonus of generally low numbers of anglers at this time of the year.

The Taupo catchment experienced substantial flooding early in October though certainly not of the scale that occurred in 1998. Changes to most rivers occurred as a consequence. It will be worthwhile for anglers to invest some time exploring new lies that have been created as in many cases, locations that produced good fishing this winter will not do so next season and in some situations, may in fact no longer exist.

Prospects this summer - as this issue of *Target Taupo* goes to print we will be undertaking our annual November acoustic estimate of the number of trout in Lake Taupo. This count coincides with the arrival of the new year class into the legal size population and is the best measure of fishing prospects over the coming summer and in Taupo rivers next winter.

If the floods in July 1998 are to have an affect on the trout population it will occur this year. Fortunately the floods occurred before the peak spawning in 1998 and our monitoring indicates juvenile trout numbers were able to



Looking upstream on the Tauranga-Taupo from below the old Crescent.

It was an outstanding winter not only for the number of fish caught but also their size and condition.

A windy spring has so far restricted fishing opportunities on the lake.

recover. Early indications from our harvest survey interviews with anglers and guides on the lake are of large numbers of young fish already close to the legal length of 45cm. These fish grow at approximately 1mm per day so will be of legal length very shortly.

Similarly the recent floods have swept large numbers of kelts back into the lake in time to take advantage of the smelt spawning. As a consequence these fish should quickly recover condition.

Whether the fishery can reach the peak of the past year is questionable, it really was an exceptional year. However our prediction at this early stage is for a good season – time will tell!

Shirley Retires

One of the Taupo Fishery Area's longer-serving staff members retired on 2 November. Shirley Oates has been with us for nearly 11 years. Shirley was programme manager for fishery licensing, publication management and executive support for the area office. Her main role was managing our network of some 130 fishing licence agencies throughout the North Island.

Target Taupo readers benefited directly from her skills in typing, proofing and layout of the magazine and managing each issue through the production process. In addition Shirley prepared agendas, took minutes and provided secretarial services for the Taupo Fishery Advisory Committee.

A full-house crowd of colleagues, licence agents and TFAC representatives farewelled Shirley at a dinner at Club Habitat in Turangi on 19 October. Her presentations included a large print of Lake Taupo and the central volcanoes. Although she has retired we haven't seen the last of her yet. Shirley has kindly agreed to a short-term contract to help us through until her successor starts on 11 December and also to assist with training. Shirley will be remembered not only for her unstinting work ethic and her excellent contribution to the fishery, but also for her common sense, courage and sense of humour in even the most difficult of times. We all wish her a long and happy retirement.

Tongariro Power Development Resource Consents

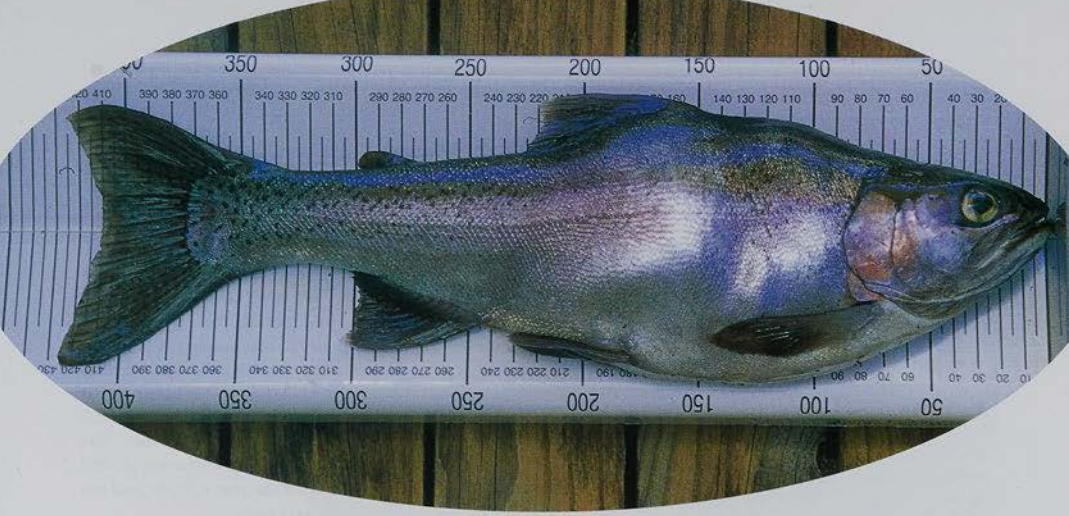
The July issue of *Target Taupo* carried a detailed article on the Tongariro Power Development scheme (TPD) and its effects on the Taupo fishery. We described the process underway for renewal of resource consents by Genesis Power Ltd to operate the scheme.

Significant progress has been made since then, with the beginning of hearings of submissions of the applications by a hearing commission appointed for the Waikato and Manawatu-Wanganui regional councils (Environment Waikato and horizons.mw). The public hearings began in Taupo on 30 October and are expected to continue until at least the end of November.

At the time of writing evidence had been presented for the applicant, Genesis Power, and submissions in support and several in opposition had been heard. DOC's submissions will be heard in late November.

We have reached agreement with Genesis on several fishery and general conservation issues. These include mitigation for effects on blue duck, management of Lake Otamangakau levels, poutu stream flows, upper Tongariro River flows and Rangipo dam sediment flushing. Key matters still in dispute are flows below Moawhango dam, the flow regime for the lower Tongariro River and the Poutu dam gate testing flows and these will be the focus of the department's submissions.

If consents are granted for the 35 year term sought then this current hearing represents a once in 65 year opportunity to recover some of the lost values of the Tongariro fishery. We look forward to a successful outcome.



We are always keen to hear from anglers if they catch something unusual. This female rainbow trout was caught recently in the Whitikau Pool on the Tongariro River by local fishing guide Bill Grace. Taupo Fishery Area Scientist Dr Michel Dedual dissected the fish and found that deformity was caused by several compressed and fused vertebrae, most likely due to physical damage or injury to the fish during its development. This deformity is the cause of the visible bumps just forward of the dorsal fin. If you look closely, the front half of the fish is much shorter than normal, in relation to the back half. The fish was otherwise in good health and condition and full of roe ready to spawn. Bill reports that it didn't put up too much of a fight though!

Winter Fish Trapping Results

by Rob Marshall

Rob is the Fishery Area Ecologist and is responsible for the fishery monitoring programmes. He is also a very keen angler.

We currently run two fish traps in the Taupo fishery. The Te Whaiau Stream trap monitors the trout population in Lake Otamangakau and the Waipa Stream trap monitors fish returning to spawn in the Tongariro system from Lake Taupo. The Te Whaiau trap operates from 1 April to the end of August every year, whereas the Waipa trap operates all year round. This year both traps have provided very good information about their respective fisheries.

Waipa Stream Trap

This trap is situated on the Waipa Stream 500m above the confluence with the Tongariro River, in Kaimanawa Forest Park. This is approximately adjacent to Rangipo Prison when you are travelling down State Highway One. It has been operating for nearly three years and a significant database is beginning to develop.

So far this year the results show an increase in the size of the run in the Waipa Stream and a slight increase in the overall size of the fish. Graph 1 highlights the increase in the number of trout trapped this year compared to last (a breakdown of the monthly run total is presented in table 1 on page 39).

The total trout trapped in 1999 to the end of September was 2992 compared to 4736 to the same time this year. These figures are yet to be adjusted to take account of those fish missed during floods, but the trend certainly shows a significant increase in the size of the run. Last year a lot of fish were trapped late in the season, during October and November, and it will be interesting to see if the same occurs this year. If so, the final run total may be very high.

Table 1 below shows an increase in the size of fish trapped this year. Overall the average length and weight of rainbow trout trapped to the end of September in 1999 was 527mm and 1.74kg (3.8lb) which compares to rainbows this year averaging 542mm in length and 1.97kg (4.3lb). Brown trout in 1999 averaged 588mm and 2.59kg (5.7lb), whereas this year they weighed 2.79kg (6.1lb) and were 603mm in length. We will continue to operate the trap until the end of December

Table 1: Average length and weight of fish measured through the Waipa trap, 1999 and 2000

	1999		2000	
	Length (mm)	Weight (kg)	Length (mm)	Weight (kg)
Rainbow female	525	1.77	541	2.04
Rainbow male	530	1.70	542	1.87
Rainbow total	527	1.74	542	1.97
Brown female	586	2.60	593	2.75
Brown male	592	2.57	616	2.84
Brown total	588	2.59	603	2.79

Graph 1: The number of trout trapped in the Waipa Stream, 1999 and 2000

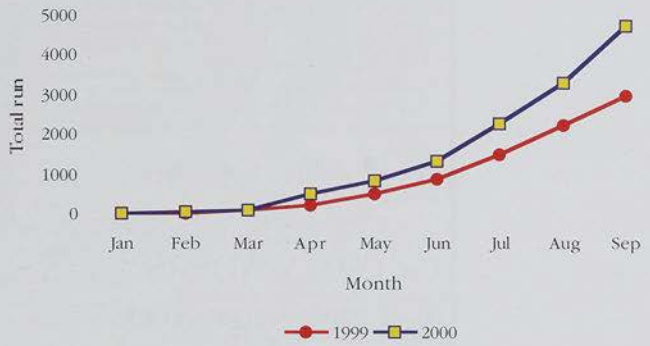


Table 2: Total number of trout passing through the Te Whaiau trap, 1999 and 2000 (adjusted to take into account fish missed during flood events)

	1999	2000
Rainbow female	526	838
Rainbow male	597	714
Total rainbow	1123	1552
Brown female	512	658
Brown male	302	470
Total brown	814	1129

and a full summary of the results will be presented in the next issue of Target Taupo.

this is still a significant increase in population size, and the total run for each species is the highest recorded (graph 2).

Table 3 shows the average size and condition of trout trapped in 1999 and 2000. There has been a slight increase in the size of rainbow trout and in contrast, a slight decrease in the size of brown trout between 1999 and 2000. Unfortunately the number of trophy (4.54kg) trout trapped continues to decline. In 1999, five trout over 10lb were trapped with the largest a rainbow female weighing 4.9kg or almost 11lb. The largest trapped this year was a 4.7kg (10.3lb) rainbow female. Only one other fish over 10lb was measured. Despite the reduction in trophy trout, the

Table 3: Average size and condition of trout trapped in 1999 and 2000 in the Te Whaiau Stream

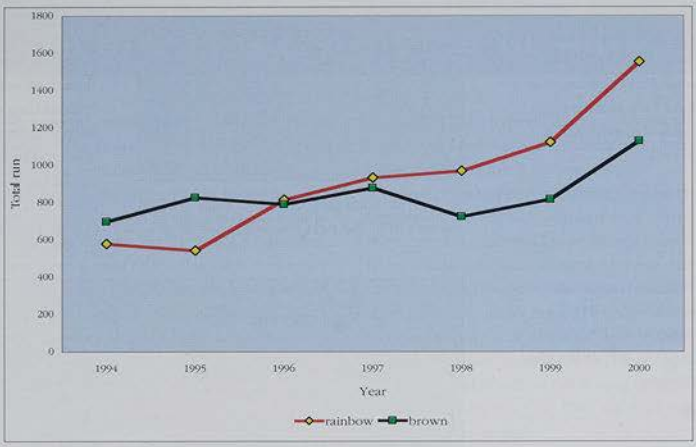
	1999			2000		
	Length (mm)	Weight (kg)	CF	Length (mm)	Weight (kg)	CF
Rainbow female	540	2.1	46.41	556	2.18	45.21
Rainbow male	530	1.9	44.22	567	2.21	43.06
Brown female	534	1.9	43.61	530	1.87	44.29
Brown male	575	2.32	43.35	571	2.23	42.66

Te Whaiau Trap

The Te Whaiau trap is located a short distance up the Te Whaiau Stream at the southern end of Lake Te Whaiau. The stream is the main spawning tributary available to trout living in Lake Otamangakau. The trap was pulled out on 31 August this year after the usual five month trapping season. Overall the season proved to be very successful with relatively settled weather conditions, which meant that the trap was only over-topped by floods on two occasions, one of which was very brief. As a result very few trout were able to pass the trap without being processed.

Since 1 April, 1345 rainbow and 1096 brown trout were trapped compared to 801 rainbow and 457 browns last year. This appears to be a very large increase, though when adjusted to take into account those fish missed during floods, the difference between years is not so high. Table 2 shows the adjusted run totals for 1999 and 2000. As opposed to the apparent 40% and 60% increase in run size based on unadjusted figures, the adjusted totals show an increase of 28% for both species. Though not as high as first thought

Graph 2:Annual spawning run of brown and rainbow trout, Te Whaiau Stream 1994 to 2000



Lake Otamangakau fishery is still very healthy as evidenced by the very strong year classes of fish entering the population over the last two years.

Evidence is pointing toward the decline in trophy trout occurring as a consequence of the number of mature fish lost over the Te Whaiau spillway during unusual spill events in the winter of 1998.Trophy trout in Lake Otamangakau are old fish and currently it is these old fish that are missing from the population. Genesis Power have modified their operation to minimise spilling and we expect that as the young fish from the current strong year classes get older that the number of trophy fish will again increase. This should be reflected in the trapping results over the next few years.

The spawning run in the Te Whaiau Stream, entering on the left, was the highest recorded since trapping began in 1994

For Sale by Auction

LAKE EDGE FISHING LODGE TAUPO

A TRULY UNIQUE LIFESTYLE

A happy tourist standing on the lodge's own boat ramp

AUCTION

A truly unique lifestyle opportunity is offered for sale on the shores of Lake Taupo and Waitahanui River for only the 2nd time in 14 years. **Waitahanui Lodge** offers accommodation featuring five cosy cottages. Two of these are so close to the water you could fish from them.

The Lodge has a busy and popular shop selling and hiring a complete range of fishing gear and flies. There are two new 12ft aluminium boats with outboards that are hired out and launched from the lodge's own boat ramp.

A loyal clientele of Kiwis and overseas tourists book in year after year. The owners have many fishing tales to tell although surprisingly a lot of guests don't even come to fish.

After seven years the time has come for the owners to let someone new enjoy this unique lifestyle opportunity.

Ph Austin Harris today 025 936 355

It could be the best decision you ever made.

To be auctioned on site Sunday
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What's Involved in Counting Spawning Trout

We make a lot of use of drift divers to count trout in the spawning streams over the winter months. It is a very enjoyable, if cold, activity but it can also be physically demanding so all divers have to have a current medical certificate. It can also be hazardous and damaging if staff don't adopt the correct techniques, particularly when swimming through the white water sections. As a consequence a lot of effort is put into training. First, each new staff member is taken through the basics in the swimming pool and then in Lake Taupo. This involves such things as swimming under water, how to duck dive and basic rescue techniques as well as a theory session. Then it is on to training in the river. Much of the success or not of a drift dive is dependent on teamwork. The team must stay in line across the stream so that trout cannot slip past unnoticed, but that it is not always that easy when you consider the different current speeds and obstacles which exist across a pool. Therefore when training a new diver we often take the opportunity to put the whole team in the river in a variety of situations to develop the teamwork.

For example, in May of this year, seven of our staff donned wetsuits, flippers, masks and snorkels and set off to the upper part of the Waipakihi River. Under the guidance of Errol Cudby, teams were organised to dive separate stretches of river with the team leader pointing out the dangers in each section and how he wanted the team to approach particular pools. The divers set off one after the other, keeping in mind the safety of the diver on each side. Each team was put through the same training but on a different section of the river.

Counting trout involves the first diver counting any fish which pass between himself and the bank, the second diver counting from himself to the first diver and so on across the stretch of water. Often we also use a diver walking along the edge of the river to count any fish coming around the end of the line.

The team prior to diving the Waipakahi River. The river is ideal for training but in case you are wondering we didn't see any fish. From right - Rob Hood, Errol Cudby, Michel Dedual, Harry Hamilton, Glenn Maclean and Rob McLay. Absent Rob Marshall.

The number of divers used on each river varies with its size. For example, on the Tauranga-Taupo four divers are used and on the Waimarino only two.

Escapement (spawning) surveys have been carried out since 1990, initially on the Hinemaiaia and Whitikau but in later years also including the Tauranga-Taupo, Waimarino and Waiotaka rivers. Sections of each river are selected where we can be confident that we cover the whole river and make an accurate count. The sections are counted monthly between May and October. The peak counts each year are presented in graph 1 on page 38. This graph highlights what an exceptional spawning season it was this year.

The Tongariro National Trout Centre Society

by Jon Palmer

Jon is the Programme Manager (Service) for the Taupo Fishery Area. He also plans the Area's work schedule and has recently taken on the liaison role between the Department and the TNTCS.

The Tongariro National Trout Centre (TNTC) is the public face of the Taupo Fishery Area. The park-like setting of the centre next to the Tongariro River, with its informative and interesting displays and facilities, attracts over 50,000 visitors a year. This makes it one of the busiest Department of Conservation visitor centres in New Zealand. The Department runs, manages and funds the centre but is greatly assisted by the Tongariro National Trout Centre Society.

The TNTC Society has evolved from the TNTC Trust. The trust, in association with local service clubs, has over the years provided funding and support for several large projects including the original building and subsequent refurbishment of the underground viewing chamber, construction of the car park on State Highway One, the rock wall leading into the grounds and the gas barbecue. The trust also assisted with extensive new signs and displays for the centre.

As the centre has developed it has become apparent that a more accessible structure in the future would be that of a society which any interested person or group can join. As a consequence several months ago a number of interested supporters made an application for the trust to become an incorporated society, which should be finalised in the very near future.

The objectives of the society are to:

1. To promote and develop the Tongariro National Trout Centre as a centre of information, resources and learning in respect to trout, trout fishing and freshwater ecology of the Taupo Fishery.
2. To foster, promote and publicise the education and understanding of the public and visitors in matters relating to trout, trout fishing and other freshwater fisheries in New Zealand.
3. To undertake, arrange and facilitate research, study, education and the advancement of learning in and understanding of trout and other freshwater fisheries in New Zealand.
4. To collect, collate, publish and distribute to the public information, publications and programmes incidental to achieving or promoting any other purposes of the Society.

To facilitate sponsorship and raise funds that may be used to assist the Department of Conservation in its management of the Tongariro National Trout Centre.

When the society becomes incorporated this will be an excellent opportunity for the local community and anglers to be involved with the development of the trout centre.

The first project for the Society, with assistance from the Department, is applying for funding in the order of $100,000 from the Tourism Facilities Development Grant Programme for the development of the interpretation centre and auditorium. If the funding is obtained it is hoped to begin work on the centre early in 2001, the building to be in place by July 2001.

For further information on the Society's activities and membership, please contact the Tongariro National Trout Centre Society (Inc), PO Box 73, Turangi.

Images of the Taupo Fishery

When we were approached to run an advertisement for the sale of *Te Awatea*, one of the most well known boats on Lake Taupo it set us thinking. Like *Te Awatea* there are a number of boats, people and places that have a long and often colourful association with the Taupo fishery. This is a new series which profiles some of those names so familiar to many Taupo anglers.

Te Awatea - The Dawn

Originally registered "*Awatea*" the 30ft charter vessel was launched on the lake in 1972. Owner/skipper Simon Dickie, when not training for, or at the 1972 Munich Olympic Games, spent many hours assisting boat builder D Norton construct the Vindex design which was to become one of the busiest charter boats on the lake.

At the time New Zealand had been "discovered" as a fishing destination, particularly by the Americans. Catching rainbow trout with relative ease, Simon Dickie and *Awatea* were soon entertaining some of the world's most well-known business people and personalities, many of which stayed at Huka Lodge. Together they were instrumental in developing and guided fishing industry on Lake Taupo.

Originally *Awatea* was constructed with a berth under the rear of the cockpit but this was removed in the mid-1980s. Other than this change she is very much as she was originally built. Constructed of heart totara with two-inch solid mahogany topsides, *Awatea* is powered by a Ford 360D series turbo diesel. With a beam of 10'6" and weighing approximately seven tons, a maximum speed of 14 knots is just possible. However it makes for a very stable and comfortable ride in any of Taupo's white water. Another feature is that *Awatea* has a second motor, a 10hp Bikh motor, complete with its own shaft and rudder. This single cylinder motor is used when trolling to give precise control at low speed with the added advantage of less noise and fumes that when using the main motor.

On acquiring the second liquor licence issued to a vessel on Lake Taupo (the first was Waianiwa), *Awatea* had to be renamed "*Te Awatea*" because there was already an *Awatea* listed in the Lloyds register of ships. In May 1988 Miles and Alys Johnston purchased "*Te Awatea*". In these years Miles spent in the order of 2600 hours a year on the water and the reputation of *Te Awatea*

Te Awatea - Miles Johnston believes over 100,000 fish have been hooked from this launch.

A catch of 38 fish, all taken harling, in the days when the fishery could support an eight fish limit

continued to build. A feature of the guided industry at the time was the demand for overnight trips taking fly fishing anglers to the Western Bay river mouths.

Many lake anglers and Taupo residents will have seen the flashing strobe light on the roof of *Te Awatea* indicating they had another trout on. It seemed a good idea to Miles that when *Te Awatea* was stationary playing a trout to let other anglers know the trout were biting, not to mention the publicity and advertising opportunity.

Through the mid-eighties and early nineties, the charter fleet on Lake Taupo more than doubled increasing the competition for potential clients. Miles was bold enough to offer a guarantee - no fish, no pay. Since the guarantee was first advertised in 1990 *Te Awatea* has been skunked just 21 times.

It is recognised that some boats are "lucky boats", that they hold some unexplained attraction to the fish. *Te Awatea* seems to be one such vessel and Miles estimates more than one hundred thousand fish have been hooked from the boat over the last 28 years.

When asked why he was selling, Miles Johnston replied "It is time to upgrade and while is going well why not let someone else have the pleasure of owning and enjoying what may be the most famous boat on the lake."

Angling Tracks Suffer Damage

Recent strong winds and heavy rain have left their mark on angling tracks and roads around the fishery.

Trees came down across tracks at Waitahanui, Waiotaka and up the Tongariro and the river cut off a meander in the lower Hinemaiaia, felling poplar and kanuka in a jumble that looks like "pick up sticks" from the air.

The Waimarino River mouth access road is washed out on the beachfront. We recently spent over $500 filling the holes at the end of the road to allow 2WD vehicles on to the beach but the current lake level leaves very little beach and it is again a big, deep hole which we won't be filling a second time. However there is still foot access to the mouth from the car park at the end of the metalled track.

The track upstream of State Highway 1 along the Waimarino has washed out around the first bend and there are several washouts on tracks along the Tauranga-Taupo. Tuki Road is eroded and impassable to 2WD vehicles though it should be repaired by the time this issue of *Target Taupo* goes to print.

At the Tongariro National Trout Centre the river walk was partly washed out and there is some erosion near the Waihukahuka mouth (hatchery stream) which has closed part of the track until it can be re-routed and re-formed. The water rose to within 10cm of the top of the revamped viewing chamber, leaving some people feeling thwarted at being unable to try out the new emergency plan – of pumping it out, hosing it clean and having it operating again as soon as the stream cleared.

All in all it was a period of very wild spring weather much more typical of years past. Perhaps it means this summer will also be more like days of old – let's hope so.

The track to the Waimarino River mouth is blocked by a large hole. Floating pumice gives the appearance of solid ground but the hole extends around and along the lake shore

Fishery Harvest Survey

A survey designed to estimate the number of trout caught and kept in the Taupo Fishery during the 2000/01 fishing season started on 1 July this year. Briefly, the study will provide an estimate of the number of trout harvested from four different parts of the fishery: trolling on Lake Taupo, fly fishing in the Tongariro and Tauranga-Taupo rivers and fly fishing around the lake edge and at river mouths. An article in the July issue of *Target Taupo* (No 34) explains more fully the details of the survey design.

Approximately five months of surveying has been completed and we are pleased to report that everything is progressing very well. The anglers who have been interviewed to date have been very helpful and keen to talk to the fishery staff undertaking the interviews. In particular, the assistance of fishing guides on the lake has been great. We actually identify them from the plane and then telephone them in the evening to get their catch details. Without exception they have been very keen to be involved in the project. This level of support from all corners of the fishery, makes our job that little bit easier, much more pleasant and greatly improves the accuracy of our harvest estimate.

There have been 40 survey days completed already this year and as you can imagine a lot of data collected. Some data from the Tongariro and Tauranga-Taupo rivers over winter has been analysed and supports our observations that the fishing this year has been very good.

We are now entering the busy time of the year with large numbers of anglers expected on the lake over the next few months. Based on the quality of fishing over winter, and in particular the size and quality of trout caught this spring, anglers are likely to experience some very good fishing in the months to come. Our interviewers, stationed at various boat ramps around the lake will be busy on those long, fine summer days. We welcome your questions about the fishing and the fishery, so please feel free to ask. Unfortunately, if there are a lot of anglers and boats around we may not be able to spare as much time as you would like, but we will do our best to answer any questions you have. As well as the interviewers at the ramps this summer you may notice a small plane flying over the lake throughout the day, counting the number of boats fishing. Give them a wave and enjoy the summer's fishing.

Team Profile

CHRIS MCMILLAN

Chris has been with the Taupo Fishery Area based in Taupo for the last two months. His conservation career started in Te Anau in 1979 where he worked with the then NZ Wildlife Service. He transferred to Lands and Survey in 1981 which then became the Department of Conservation in 1987. In 1991 Chris became the Compliance Co-ordinator for DOC in Southland/Otago.

In 1996 Chris and his family worked as volunteers in northern rural Tanzania. Chris's wife Kirsty was a clinical nurse tutor working in the hospital and nursing school.

When not catching giant Nile perch, Chris worked as projects and maintenance advisor within the hospital resurrecting the failed sewage system in local villages. Several community projects involving water and schools were set up and received New Zealand Foreign Affairs' funding.

Chris enjoys an active outdoor lifestyle including golf, bee keeping and brewing.

Chris and a Nile perch

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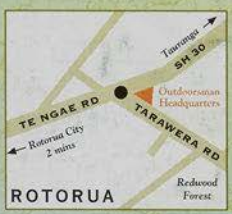

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