Bob McDowall –
Essays of a Fishery Scientist:
50 years of experience

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Preface

It gave me real pleasure to compile this collection of Bob McDowall’s essays. All were written for Fish & Game New Zealand, and we are indebted to the editor, Bob South, for permission to republish them here.

I first met Bob in 1969. He had just returned to New Zealand after completing his PhD at Harvard University. In 1973, I started working in the same laboratory as Bob and did so until his retirement in 2000. I greatly admired his scientific knowledge and prodigious output, as did many of my colleagues. Re-reading these essays, I am also reminded of other sides of Bob’s character – the naturalist, conservationist, and angler.

Bob’s early fishing experiences were on the Tongariro River and Lake Taupo. It was Bob who taught me to fish the Tongariro in the 1970s. In those days we used fast-sinking lines and lures (large wet flies) fished downstream. Bob still used a Hardy Wye cane rod, a gift from his father. The Tongariro River features in a number of these essays; it was formative for the young McDowall as he came to understand and love the river itself and the abundance and diversity of life it held. That love didn’t change for Bob, although after the Tongariro Diversion and the great flood of 1958, the river was never quite the same. As much as he loved trout fishing, his name became synonymous with whitebait, and from there to the rest of the native fish fauna. He was truly the father of freshwater fish in New Zealand – he identified and described them, studied the biology of many, and warned about the impacts that the spread of trout and loss of habitat were having on many species.

Bob’s scientific papers and popular writing embraced a impressive range of subjects. These essays range from frogs and fish, through biographies of prominent environmentalists and explorers, to personal reflections on values and changes experienced during a lifetime’s work. Most of the essays were written in the evenings, in a comfy chair with a laptop balanced on his knee. Writing came easily to Bob, and popular articles were not only a means of conveying information, but also a form of relaxation from the more rigid and demanding world of scientific manuscripts. He enjoyed this style of writing, and it is my hope that readers will equally enjoy what he’s written. He leaves a huge hole in the world of freshwater fisheries in New Zealand, but has left us a vast legacy of written material.

For convenience, the essays have been grouped into four general sections:
- the biology of native and introduced fish
- management of land and freshwater
- biographies
- perspectives on lakes, rivers and fish.

I have written a brief introduction to each section. Bob South wrote the introductory comments (here in bold type) to many of the essays when they were first published. The line drawings are some of the many that Bob did of New Zealand’s freshwater fish. The drawings show the diversity of fish present in New Zealand’s freshwaters, and also some of the skill and detail Bob brought to his work. Enjoy.

Don Jellyman
Compiler/editor
Principal Scientist, Freshwater Fisheries, NIWA
Thanks for the legacy

Fish and Game 72, 2011

It was Issue 14 in 1996 when our paths first crossed. I knew of R M McDowall as an internationally respected freshwater scientist, an authority on New Zealand native fish, and author of several highly acclaimed books. But, as editor of a fledgling magazine, I’d always considered a man of his prowess out of the league of this publication. I was wrong. Dead wrong. Bob, a tower of a man I grew to know and greatly admire, was as amenable to writing for Fish & Game New Zealand as the bloke next door. And from that first contribution, New Native Fish Found, Bob went on to become, as he did in every pursuit, a champion and championed contributor. Readers devoured his articles and begged for more. And amidst an unbelievably busy schedule, even in supposed retirement, he willingly gave more, until, sadly and all too suddenly, he passed away in late February in Christchurch.

From 1996 to 2009, McDowall wrote no fewer than 63 features for this magazine. He also wrote 12 books and 267 scientific papers in his illustrious career, but, significantly and selfishly from where I sit, of the 232 popular articles he wrote, Bob shared more than a quarter of them with us in our pages. We were blessed. We are indebted.

His topics were varied – from the Taupo fishery to the Selwyn, from salmon to his beloved galaxids, from the Tongariro and Lakes Young and Dunstan to the Falklands, from shags and browns and rainbows and native grayling to bush tucker. He was a genius with words. Some of his best work for us came in his column, People of the Past, in which he wrote of great men, long deceased, whose deeds helped shaped the fishing and hunting landscape of this country. He profiled Cecil Whitney, Thomas Donne, Charles Douglas, Lake Falconer Ayson, Tom Andrews, Thomas Brunner, Derisley Hobbs, William H. Spackman, Leonard Tripp, Gerald Stokell, Edgar Stead, and, not to be omitted, the American Aldo Leopold, a revolutionary among fish and game managers. One day, some worthy successor will write of Bob McDowall with the same reverence and grace that he wrote of these important men. He shares their greatness.

Bob was always a busy man, a prolific wordsmith and, to my eternal detriment, I did not manage to publish all that he wished to share, among them stories with titles such as ‘Death by a thousand cuts’, ‘R & K selection’, and ‘It wasn’t all science’. He never worried about their non-appearance. Always happily occupied with other pursuits, he just carried on. His latest project before his death was completing yet another book, and arguably his finest: ‘Ikawai, Freshwater fishes in Māori culture and economy’ is an 872 page compilation of historic and contemporary Māori customary fisheries, which will be released soon.

Previous epics included a 553 page ‘bible’ published in 1978 and re-printed several times, entitled ‘New Zealand Freshwater Fishes, A Natural History and Guide’. It is the most comprehensive book on New Zealand native and introduced species, including 53 species found in our waters (27 native, 20 introduced, six marine wanderers). Concerned about the human impact on our freshwater fisheries, Bob wrote in the final chapter: “Given that fish populations and habitats have taken such a drubbing from diverse land and water management practices, the issue that needs attention is to determine the appropriate conservation response. Protection needs to be afforded the populations and their habitats if the conservation values … are regarded as valid.”

McDowall also wrote the 508-page 1994 blockbuster, ‘Gamekeepers For The Nation, The Story of New Zealand’s Acclimatisation Societies 1861-1990’. His parting shot in this book deserves repeating. I can hear Bob loudly shouting the message even now: “Our angling and hunting are only as good as the habitats allow and require only minimal management – and that’s all they have got over the past 130 years. The strength of our fish and game populations has depended on our pristine habitats and small human populations. But both of these are changing: the future will require much more explicit and focused management and we can only hope that the fish and game councils are up to the task.”
William Hazlitt, an early 19th century English essayist, literary critic, grammarian and philosopher, once wrote: “The world judges men by their ability in their profession, and we judge ourselves by the same test: for it is on that on which our success in life depends.” No one can doubt Bob McDowall’s incredible success in his extraordinary life, nor ever dispute the irrefutable legacy he leaves for lovers of fish, fishing, fisheries science, history, and New Zealand’s rich, vibrant culture.

Bob South
Editor, New Zealand Fish & Game
1. On the biology of native and introduced fish

These essays describe the distinctive biology of some native species, and include a walk through the biological minefield of identifying the different varieties of trout. Although many of our native fish are classified as ‘threatened’, fortunately we have only lost one species, the grayling. These vegetarian fish occurred in prolific numbers in the lower reaches of larger rivers. Bob discusses their biology as he has been able to piece it together, and possible reasons for their extinction. In the early essay he wrote on new native fish, Bob admits to his surprise that what was formerly regarded as a single variable species (the common river galaxiid, Galaxias vulgaris) has since been shown to be a species complex—unraveling this complex is still continuing.

Much of Bob’s early research focused on identifying various whitebait (Galaxias) species and the conditions under which whitebait shoal and migrate into the mouths of rivers. Modern microchemical techniques have demonstrated the role of ‘sources and sinks’ in whitebait biology—i.e., that whitebait runs in some rivers are sustained by spawning in others. Bob discusses this principle, which was a major reason he was highly sceptical of the likely success of whitebait farming.

While smelt were successfully introduced into Lake Taupo in the 1920s and were the salvation of the trout fishery (after trout had almost eradicated the native kōaro), their introduction in Lakes Poerua and Brunner in the 1960s and 70s was deemed to have failed. Hence their appearance in Lake Brunner in 2001 came as a complete surprise and showed something of the resilience of native species. However, the same species led to the disappearance of kōaro in Lake Rotopounamu, when it was illegally introduced a few years ago, so not all fish extirpations are due to the spread of exotic species.

There have long been disputes amongst anglers about the origins and races of trout introduced into New Zealand. As if that weren’t enough conjecture, scientists changed the name of rainbow trout and included it in the same genus as Pacific salmon. Bob eloquently dispels the validity of a number of brown trout races and explains why it was necessary to revisit the scientific name of rainbow trout.
1.1 New native fish found

*Fish and Game* 14, 1996

Robert McDowall, a highly respected scientist working for NIWA in Christchurch and author of eight books including the authoritative *New Zealand Freshwater Fishes*, examines how many native New Zealand fish species exist in our rivers and streams, and, to his own astonishment, makes some surprising discoveries about recent changes in our known fauna.

If you had asked five years ago, “how many species of native freshwater fish occur in our rivers, streams, and lakes?” I would have said with complete confidence that 27 species are recognised, of which one, the grayling, is extinct. That being so, you should expect to find 26 species. It looked as though everything was pretty much under control. There had been family revisions of most of the fauna, and there seemed no reason to expect any major changes.

But how wrong I was! Over the past four to five years, a surprising change has occurred in our perspective on the fauna, brought about by a number of factors.

First, a growing knowledge of the fauna’s ecology and genetics has brought about change. I thought the small species of bully described by Gerald Stokell from a group of lakes in the headwaters of the Clarence and Waiau Rivers, in Marlborough high in Molesworth Station, was really an outlying population of the North Island Cran’s bully. However, when collecting some fish there, it was found that these lake populations have tiny eggs which don’t resemble the large eggs of Cran’s bully. And a re-examination of fish from the lake s resulted in restoration of what we call the Tarndale bully (*Gobiomorphus alpinus*) as a valid species - first described by Gerald Stokell in 1962. We call it the Tarndale bully because the lakes in which it occurs are on what was once Tarndale Station, though it is now a part of Molesworth. It is a tiny fish, growing to no more than about 75mm, and resembles the slender, lake-limited populations of common bully.

Scientists at Otago University’s Department of Zoology began studying the fish fauna of the Taieri River. Stream ecologists Colin Townsend and Todd Crowl began to find two different sorts of *Galaxias* in the Kye Bum, one of the headwaters of the Taieri not far from Ranfurly in Central Otago. Geneticist Graham Wallis found that these two forms were genetically different from each other. I had thought all inland-living, larger *Galaxias* from the eastern South Island, from Marlborough to Southland, represented one rather variable form that we knew as *Galaxias vulgaris*, the common river galaxias. This has proved to be wrong.

The Otago University findings set in motion a thorough review of the so-called common river galaxias, and it is now my view that the populations south of the Waitaki River actually represent four different species. One of these involves another restoration of an old species first described in 1959 by Gerald Stokell - his *Galaxias anomalus* - which I call roundhead galaxias. This is one of the species found in the Kye Burn and we have since found it to be widespread across Otago and Southland. The second species in the Kye Burn proved to be undescribed. We called it *Galaxias depressiceps*, because it has a distinctly flattened head, prompting the common name flathead galaxias.

In association with the work on these species, and with new insights into the nature of variability in these high country, eastern South Island galaxiids, I returned to the study of a population that I first drew attention to as being “peculiar” in 1970. This is a population in a small stream that drains Munro Dam, a small dam in some pine forest near Lake Mahinerangi on the Waipori River. Though I knew that the fish there were unusual, I had not pursued this, and the population remained unstudied. We collected further material and came to the conclusion that this represented a further undescribed species.

Exploration of the headwater tributaries of the Waipori River by Richard Allibone, in association with the Taieri River studies of Colin Townsend and Todd Crowl at Otago University, with funding support for some work I was doing for the Department of Conservation, showed there were fish the same as those in the Munro Dam Stream in at least two other Waipori River tributaries. Furthermore, these exploratory studies revealed yet another undescribed species that is distributed through the tributaries of the
mid-lower Taieri – streams like Lee Stream, inland from Outram, and the Traquair Burn nearer to Middlemarch, as well as some further tributaries of the Waipori.

So, to wrap up, what has for 25 years been regarded as a single, rather variable species, present throughout the eastern South Island, has proved to be five species - the true “common river galaxias”, *Galaxias vulgaris*, in and north of the Waitaki, and four further species to the south. All of the problems are not yet resolved. There are populations in North Otago that we cannot yet place into the correct species with any certainty. And identification of these species in the field is going to cause all sorts of problems for practising biologists. People may fairly ask why, if they are so difficult to identify, do we insist on describing this complex of species? The answer is that it is really important for proper understanding of the historical, evolutionary processes that have produced our fauna. It is also important for the effective conservation of New Zealand’s biodiversity. And this apparent diversity of species in the Otago area is consistent with what has been found for lizards, insects, and plants in Central Otago, an area with an ancient geology.

When much of New Zealand’s present area was submerged by sea about 40 million years ago, much of Otago remained as dry land, and the complexity and diversity of the animal and plant faunas of the area may have some connections with these ancient geological events. By comparison, the Canterbury Plains are very young, being formed by the outwash of gravels as the Southern Alps pushed upwards over the last few million years. So, it is likely that the populations of common river galaxias in the Canterbury Plains are derived by one of the Otago species spreading northwards, possibly from the Taieri River, as the plains were formed.

Although biologists have explored most of New Zealand over the past 30 or more years, there are some corners or pockets that have escaped attention. One of these is the Chatham Islands, and a few years ago biologist Charles Mitchell had the opportunity to examine some of the small, peaty lakes in the southern Chathams. Here, he found a really unusual *Galaxias* that he named *Galaxias rekohua*, a blotchy little lake-living fish that reaches no more than 75mm. How widespread it may be on the Chathams we have no idea.

Several years ago, the Museum of New Zealand in Wellington sent me several samples of fish collected from Stewart Island, another area that has been poorly surveyed for its freshwater fish fauna. Most of these were collected by Richard Allibone and his friend Lindsay Chadderton. They were together working on their MSc degrees - Richard at Otago and Lindsay at Canterbury University. They found a modest variety of native fishes on Stewart Island, most of them the predictable sea-migratory species like eels, several whitebait species, and bullies. However, for the first time, they discovered what appears probably to be populations of flat head galaxias, *Galaxias depressiceps*, from rivers in the central region of the island. I say probably because I have still some uncertainty about what these fish are. More interesting, however, was a small bottle with just two fish in, collected several years ago from the Robertson River at the very south of Stewart Island, by Andy Roberts from DoC. I don’t know how many times I picked up that bottle, looked nonchalantly at the fish, and put it down again without really noticing what they were like. I read recently that “what you see depends on where you are looking from”. I was looking at the bottle with these fish from a position of no expectation that they would be as interesting as they proved. Yes, they are certainly another new species of *Galaxias* awaiting description. Here we have a superficially nondescript fish that turns out to be really distinct from all described forms – very chunky in build and quite different from anything else I have seen.

So, taking into account all the “new” or “resurrected” species I have discussed, the fauna has grown from 27 species to 34 species. Where will it end? Will biologists go on splitting what we think are good species in to several, as happened with the tuatara, of which there are now two or more recognised distinct species? It is hard to say. I have a hunch that what we presently call Cran’s Bully (*Gobiomorphus basalis*), which is wide spread throughout the North Island, especially well inland, may represent two species. Studies of the fish’s breeding biology have shown distinct differences in egg size between Wellington and Auckland populations. And we have found that although Wellington fish will reproduce with
Auckland fish, fertility and hatch rate is low, pointing to some quite strong reproductive isolation. That’s a problem for future study.

Perhaps the most surprising finding of all, however, compared with all the above discoveries, fascinating though they may be to the purists, is the following. NIWA biologists from Hamilton, Jacques Boubée and Ben Chisnall, were shown some peculiar eels from the Waikato River. They are heavily spotted and blotched and have greenish colouration, and were obviously different from our normal short-finned and long-finned eels, *Anguilla reinhardtii*. Genetic studies by Christchurch NIWA geneticist Lucette Dijkstra, confirmed that these eels are the Australian species, which we are calling the spotted eel to distinguish it from our native long-finned eel. Together with another Christchurch NIWA biologist, Don Jellyman, these various workers have shown that there are spotted eels in rivers along the north western coastline of the North Island, and that there are representatives of age classes in the Waikato River going back every year for at least eight years. Thus spotted eels have been invading the Waikato on a regular basis for that long. Local eel fishers reckon they have been taking these eels for up to 25 years. How are they getting here? Eels spend the first year or two of their lives in the sea. They probably spawn in the south western tropical Pacific, and the young are carried and swim back to New Zealand and Australian waters, in part assisted by major oceanographic current systems. We don’t really know exactly what has been happening. Perhaps there has been a shift in the way these ocean systems function and the directions in which they flow, maybe owing to global warming or some other macrochange in the earth’s climate or environment. Or, perhaps the spotted eel has been getting here for decades and could not establish itself, but now has. We really have little idea.

In a broad context, this is probably the first authenticated instance of long distance transoceanic dispersal and establishment by a “freshwater” fish. Marine fishes from the western tropical Pacific often arrive in northern New Zealand waters, usually as larvae and juveniles. Often they just live there over summer but die or emigrate back in to the tropics when temperatures fall in winter. The spotted eel presumably arrives by somewhat the same mechanism.

If ocean current systems have brought about changes in the way eels reach our shores from the subtropical oceanic spawning grounds, there could be implications for our other eel species. Charles Mitchell has already suggested that recruitment of eels in New Zealand populations is highly erratic, with sometimes long time gaps between significant arrivals of young. Perhaps this erratic recruitment is caused by the same mechanisms that have resulted in the arrival of the spotted eel. Whether the spotted eel will continue to arrive, and what impacts its addition to the fauna of our rivers will have on existing fish communities, remain to be seen.

So, overall in the past few years our perspective on the native fish fauna has changed significantly. Two species formerly rejected have been restored. Four new species have been discovered. And one Australian species has arrived in our waters by natural dispersal process and has become established here. The fauna has grown from 27 species recognised in 1990 to at least 35 species now - a growth of nearly 30% and something that has caught nearly all of us unawares. Obviously, this cannot continue indefinitely.
1.2 On names of species and trout

Fish and Game 18, 1997

NIWA scientist Robert McDowall discusses recent changes in the scientific name of rainbow trout, explains why these changes have been made, and looks at life history variability in some trout and what this means for their naming. As well, McDowall revisits the question of steelhead in New Zealand.

Recent literature on names and species of trout either announces or explains changes in scientific names applied to trouts. These seem likely to cause confusion, frustration, and even irritation amongst anglers, concerned mostly with catching trout and enjoying the outdoors though many anglers have deeper interest in natural history than this, and like to understand the identity and habits of fish they catch. So, not surprisingly some recent changes in trout and salmon names are unsettling. Several salmonids with well-known and easily-remembered scientific names suddenly have new names, while several old names, long in use, have disappeared. There is also still some usage of names like Salmo irideus for rainbow trout and Salmo fario for brown trout, and yet these names were discarded decades ago. But, as many will know, the scientific name of the rainbow trout was changed by ichthyologists, yet again, just a few years ago.

For decades, rainbow trout in New Zealand were referred to as either Salmo gairdnerii or Salmo irideus. Ostensibly, these two names were used to distinguish between steelhead or sea-migratory (anadromous) rainbow trout and entirely freshwater stocks, but this distinction was not always consistently applied here, or anywhere else for that matter. It became clear that we have no anadromous rainbow trout (steelhead), here and never have - our fish are freshwater resident. This question has been debated, but I know of no hint that there is a steelhead migration into our rivers. The occasional rainbow may wander to sea and back, but that’s as much as we can claim. Because our rainbows aren’t anadromous, some commentators insisted we call our fish Salmo irideus. But studies of the origins of our rainbows in California showed that though they are not sea-migratory here, they are derived from a stock of anadromous (i.e., steelhead) rainbows.

Eventually, the passion (and confusion) was taken out of this debate when North American biologists decided that anadromous and non-migratory stocks of “rainbow trout” were life history variants of one species correctly known as Salmo gairdnerii. Whether the specific name should be gairdneri (one “i”) or gairdnerii (two “i”s), is another debated question - but laws on formation of scientific names for species clearly indicate that whether to use one “i” or two “i”s depends on what name was originally published - and that was clearly gairdnerii (two “i”s) and that should be the end of the story. Some North American fisheries biologists and journal editors disagree, but I think the rules show that they are wrong!

However, even all of this became academic when Salmonid biologists decided that the correct name for the rainbow trout is Oncorhynchus mykiss, causing more consternation than any of the above. The new name is now accepted and its use reasonably routine, though some publishers still add “(formerly S. gairdnerii)” after first use of Oncorhynchus mykiss, to reassure the confused.

Any will recognise Oncorhynchus as the generic name for Pacific Salmon. Does this mean that the rainbow trout is really a Pacific Salmon? In a sense: Yes, it does, along with cutthroat (now Oncorhynchus clarkii - notice two “i”s again!), and other western trouts now in Oncorhynchus. Primarily what this means is as follows (pay careful attention): Rainbow and cutthroat trouts are considered more closely related to Pacific Salmons than to “true” trout (Salmo) of the eastern Atlantic, i.e. one part of the Salmonid “family tree” contains North Pacific Salmon and several western (species of Oncorhynchus), and another part of the family tree contains European trout and Salmon (brown trout, Atlantic Salmon, and several lesser European trouts). Putting the rainbow in Oncorhynchus thus demonstrates its real “family” relationships.

That, I hope, explains Oncorhynchus, but why mykiss? This name was first applied to a trout from Kamchatka Peninsula, eastern Siberia. Comparisons of this trout known as mykiss, with North American rainbows known as gairdnerii, showed them to be indistinguishable - both in appearance and genetics.
So they aren't distinct species and rainbow trouts of western North America and Siberia belong to the same species. Rules governing the name to be used in such an instance require that the oldest name has priority - mykiss is older than gairdnerii, and so is the name to use. Thus, the rainbow trout’s name is Oncorhynchus mykiss.

So, what is a rainbow trout, and how does it differ from a steelhead? If all this seems complex, it's only a beginning. It is now accepted that what has been known as “rainbow trout” in California and Oregon, actually comprises two distinct forms - and these are not, as might be assumed, anadromous steelhead and non-migratory, resident rainbows. Rather, there are two forms (distinct species?) of western trout (excluding cutthroat which is another story), both of which have anadromous and non-migratory forms. These are presently referred to as the “rainbows” and the less well-known “redband” trout. Both rainbows and the redband have anadromous (steelhead) type and non-migratory (entirely freshwater) types. So, in essence, there are four “types” if you include the two “species”, and their two “life history strategies”. Taxonomists (who describe and name species) have yet to take the plunge and formally declare that these are two distinct species, though it seems inevitable that eventually, two species will have to be recognised.

Given that these two forms are present in Californian waterways, and that our “rainbow trout” were originally introduced from California in the 1880s, the question arises concerning what New Zealand has. Frankly, at this stage, we are uncertain. Clearly we do have true rainbows (as opposed to redband). Our best known rainbow trout fisheries seem to be derived mostly from importations from coastal northern California - I say mostly, for that’s not the end of the matter. In the 1930s, we also received trout ova from “inland drainages” of California, and which could have been redbands. Precisely what happened to these consignments, and whether any of their progeny (or genes) survive in our rivers, is not yet known. Rainbows and redbands hybridise, especially in disturbed habitats, and possibly this has happened here - that some redband genes are in some of our rainbow populations. There could be populations that are largely redband. Genetic studies are needed to clarify this.

Does it matter that we may have both rainbows and redbands? Perhaps not much, though if we knew that there were redband in our rivers, especially if there were pure stocks, possibly efforts should made to ensure that they are kept distinct. This knowledge might affect how we manage our trout stocks to ensure that the purity of stocks is not disrupted by careless mixing of the two types.

Problems also occur with brown trout. In a recent issue of Fish & Game New Zealand, Hugh McDowell (no relation - he’s Irish, and my ancestry is Scottish!) referred to various sorts of brown trout in Lough Neagh in his Irish homeland. He raised a problem that Irish geneticists have been studying for a decade. Again, we face a complex situation that is as hard to explain as it is to solve. Readers of older literature, will know that New Zealand writers have at times referred to brown trout as both Salmo trutta and Salmo fario. Writers such as George Ferris insisted that we have both species. Traditionally, in Great Britain, Salmo trutta was used for sea-migratory, anadromous brown trout, with Salmo fario reserved for residential browns. But as with rainbow/steelhead, biologists long ago decided that these two life histories are behavioural variants of one species, and for decades we have known all brown trout as Salmo trutta.

Again, as in western North America, the situation is proving more complex than hitherto thought. The simplicity of one species of brown trout might be wrong - not that the decision that Salmo trutta and Salmo fario are the same species, is in question. Rather, as Hugh McDowell discussed, there are other forms of “brown trout” in parts of the British Isles. Genetic studies show that in some Irish lakes, including Lough Neagh, there are up to three genetically distinct forms of “brown trout”, known as “sonaghan”, “gilleroo”, and “ferox”. They look distinctive - to experienced observers and anglers, and ecologists find that they behave differently, and have distinctive microhabitats and diets, and different timing and locations of spawning. These differences keep the various forms apart at spawning, they remain different, generation after generation, and breed true to parental type. Using “genetic fingerprinting” technology, like that used in forensic science to identify criminals, geneticists are showing that these three forms of Irish trout are genetically different from each other, perhaps different enough for them
to be distinct species. Irish biologists increasingly talk of three different subspecies of “brown trout”, but I think that, eventually, they’ll have to “bite the bullet” and treat them as three distinct species - I don't believe that subspecies can coexist in a lake without interbreeding and merging into a single gene pool/species; that this hasn't happened suggests that they are distinct species.

Readers interested in New Zealand history will know that last century, acclimatisation societies wrote of diverse types of trout, including _Salmo carpio_ from Italy, _Salmo levenensis_ from Loch Leven in Scotland, _Salmo gaimardi_, also from Scotland, _Salmo lacustris_, etc. They thought the various forms had different behaviours, and were of varied angling value. Some were favoured while others were scorned. Otago Acclimatisation Society, for instance, wrote in 1880 of “Rhine trout (Trutta Lacustris Carpio)” being a “very undesirable addition to our Salmonidae”. While much of this has since been rejected as myth or fable, it is not all, as Hugh McDowell explained in his article.

Why all this complexity and confusion? And again: Does it matter?

These problems just highlight how difficult taxonomy (the science of recognising and describing species) can be. Among “academics” these differences really do matter, for a whole host of reasons, but anglers may fairly ask why these “academic” differences should be inflicted on them. Couldn’t taxonomists just quietly get on with tinkering with names and species, and leave anglers to get on with their fishing for “rainbow trout” and “brown trout”? Hopefully, I can explain why these points are important - maybe even interesting!

When examining these questions we are really looking at the processes of evolution, or speciation, taking place. Species multiply by dividing into two species. This splitting process doesn’t happen instantaneously, and sometimes is happening “right now” in an evolutionary, historical sense, as perhaps with “brown trout” in Lough Neagh. When we are trying to determine how many species of rainbow and brown trout there are, we may actually be examining the splitting process as it is happening. And, when this is so, it is difficult to determine whether we are dealing with one species, one species in the process of splitting into two species, or two quite distinct species. Not only does the transition from one to two species take time, but the process of splitting may involve diverse character types, including genetic characters (such as DNA), morphological characters (shape and colouration), and behavioural characters (such as breeding and feeding behaviour). Further, various character complexes may evolve at different rates, e.g. body form may be more similar than behaviour and genetics. Sometimes differences are reflected primarily in genetics or behaviour, and general appearance is little different, making for real problems in identification. This really can be very difficult, and there are some virtually unsolvable problems, including problems that relate to the various species of trout we are presently discussing.

Some critics argue that experts ought to recognise “distinct” species only when it is obvious that they are different - they can be told apart because they are different. But how different do they need to be and what differences count? What if they look the same and have different behaviours or ecologies, as noted above? And what differences count while others don't? Some species have males that look different from females, and in the past it was not uncommon for males and females of a species to be described as different species. Some species have juveniles that are different from adults into which they grow. And again juveniles were formerly been assigned to different species from their adults (as in the leptocephalus larva of the freshwater eel). But, eventually, as biologists study life histories and ecology, it becomes obvious that these male/female and juvenile/adult pairings represent different aspects of one species.

It isn't always that simple (if that is simple!). Some species are known as “polymorphic” species, i.e. they come in two or more “morphs”, or forms, that they may look very different. Such differences are not sexual differences, and when they come to reproduce, it has been found that different morphs reproduce together, showing that they are the same species. Both rainbow and brown trout are “ecologically polymorphic” - they have two distinct life history forms - anadromous and non-migratory forms - which may interbreed on the spawning grounds. Polymorphism is reflected in colouration of brown trout - sea-migratory brown trout are bright silvery coloured, quite different from heavily-spotted, river-resident brown trout.
Anglers will be well familiar with an additional type of colour polymorphism in river-resident brown trout. Mature fish from small, high country streams have lots of bright red spots, while those from larger rivers have fewer well-spaced large, round, brown spots, and lake browns have many small dark spots. These various forms are as different from each other as plenty of other, closely-related species are different from each other. But, in all probability, all three forms may, in one stream or another, be found to share the same spawning grounds and interbreeding. Given all these seemingly unsolvable problems, where does this leave Kiwi trout anglers? No doubt somewhat confused. At present, fish biology really can't offer any clear indications of what we have in our rivers and lakes.

To summarise as best we are able:

1. Clearly, we have true rainbow trout, now known as *Oncorhynchus mykiss*, which along with cutthroat (*Oncorhynchus clarkii*), it is more closely related to Pacific Salmons than to European/North Atlantic trouts. Calling it a trout may offend some purists, though there is no reason not to.

2. Possibly we also have Californian "redband trout", though this remains unconfirmed and we need genetic studies to compare the DNA profiles of our "rainbows" from diverse locations to known rainbows and redbands from California to resolve that question.

3. New Zealand introduced all sorts of strains of brown trout during the late 19th century (as well as some so-called sea trout as late as the 1960s). At present, no studies have addressed just what sort(s) of brown trout are present here now, though our brown trout do include both sea migratory and river-resident stocks. Given the questions raised by Hugh McDowell, and the Irish studies, discussed above, some interesting discoveries could lie ahead.

What about the question of the steelhead in New Zealand? There is an old Biblical saying about the blind leading the blind and both ending up in a ditch. That, it seems to me, is what Ben Wilson is doing, in suggesting (Fish & Game New Zealand Issue 14) that because North Americans fishing the Great Lakes call migratory rainbows caught there "steelhead", we can justify calling rainbows in Lake Taupo steelhead. Whether or not some people in eastern North America call lake migratory rainbows "steelheads", they aren't, and calling them steelheads is wishful thinking. Steelheads are anadromous (sea-migratory) rainbows, and to call our Lake Taupo fish by the same name is misleading, confusing, and worst of all engenders the time-weary suggestion that if we liberated enough rainbows into some coastal rivers, a real "steelhead" stock would develop. It's been talked about often, there have been occasional claims of sea-migratory rainbows here, and Pat Burstall, former Conservator of Wildlife in Rotorua, invested a lot of anglers' money in trying to establish a run. But it seems that, simply, any rainbows that go to sea from New Zealand rivers never find their way back again. So we don't have steelhead, and let's not confuse the issue by pretending we do. Sorry, Ben, I disagree with you.
1.3 Upland bully – champion of the breeding stakes

*Fish and Game* 19, 1997

Distinguished NIWA scientist Bob McDowall explains the rather remarkable sustainability of this tiny fish.

Virtually all characteristics of animal and plant species are influenced by selection - part of the "struggle for survival of the fittest" as it is often described. We almost naturally think of animals being adapted for what they do - harrier hawks have sharp talons and curved beaks because they are predators, or native geckos have mottled brown, or tree-green colour patterns that help them to merge with their surroundings and so minimise predation or enhancing their ability to capture prey.

We think of whitebait being transparent because when they live in oceanic plankton they become almost invisible to predators - and damned hard to see when you're trying to catch them, too, as they come up river. Rainbow trout have blue to green backs and silvery bellies as a form of countershading that reduces their visibility to both predators and prey, from above and below. And, we could go on indefinitely, exploring the wonders of adaptation, all the product of natural selection favouring the survival of individuals best fitted for living where they do.

Less often, we think of life histories in these sorts of terms, but they, too, are shaped and developed under pressures on populations from natural selection. Some ecological theorists divide species into two types of contrasting life history strategies:

1. some species produce large numbers of very small young, and invest very little or no effort in nurturing them once produced. The theory is that though very little energy is invested in producing and caring for any individual egg or young, because there are so many, some of them will make it through the treacherous first few weeks and months and grow on to maturity. Ecologists call these species "r-selected"

2. at the other extreme, some species produce a small number of young, but invest a great deal of energy in various ways of ensuring their survival. Some produce large eggs, so that when the young hatch they are bigger and have a better chance of surviving. Some species care for the eggs and/or young, further enhancing their survival.

I suppose mammals are an extreme in that they produce few large young, and then continue investment of energy by feeding them milk and providing "family" environments for them to grow up in. These species ecologists call "K-selected".

What they are called doesn't matter so much as understanding what is happening in terms of their life history strategies. In effect, there is a series of what are known as "trade-offs" - as between many small eggs/young and fewer larger ones, or the costs of caring for them versus the risks of just abandoning them. The volume of eggs that a fish can carry is clearly limited by its size, and it makes an "evolutionary decision" about the balance between egg size and egg number. Mostly they can't have lots of large eggs. Each species has evolved its own characteristic combination of "breeding products" that are selected to maximise survival, and there is no "best" solution.

Talking about r-selected and K-selected species is, in many ways, just focusing on the two extremes in a continuum, and various species can be found in any position along that continuum. Furthermore, some species exhibit both r-selected and K-selected characteristics in combination. These sorts of extremes, a famous British ecologist has called "naive dichotomies"; nevertheless, within limits, they have something to teach us.

Comparisons are most apt when considering closely related species. The trade-off between the "many/small eggs" and "few/large eggs" reproductive strategies can be seen in New Zealand's bullies (*Gobiomorphus* species) that are common in our rivers and lakes. Some species, such as the redfinned bully (*Gobiomorphus huttoni*), produce many tiny eggs which result in equally large numbers of tiny...
larvae, and these move off downstream into the sea (or in some other bully species into the surface plankton of lakes). There, they are preyed upon by other small fish and survival is probably low. But enough of them survive to return to the rocky/cobble riverine habitat where the adults live, and so sustain the species there. Other species, such as the upland bully (*Gobiomorphus breviceps*), produce fewer but much larger eggs, which result in larger larvae. These don’t go to sea, but make their early life around the margins of streams. Predatory pressures may be low, survival is higher, and eventually they too grow, and move into the adult habitat. The redfinned bully would be described as r-selected, by comparison with the K-selected upland bully.

However, whether they produce many small eggs or fewer large ones, all of these bullies invest effort in establishing a nest where the eggs are deposited, and the male guards the nest, sweeping away silt, perhaps oxygenating the water around the eggs at the same time, and also keeping predators away. Guarding a bully nest involves two to three weeks of energy expenditure by the male bully. He is black coloured when guarding, presumably to make him look more “fearsome”, thus raising his ability to deal with threat, but being black probably exposes him to more predation by eels and fish-eating birds because he is more easily seen, thereby increasing his risk and lowering his survival rate. Thus there are real costs of energy and survival for the male bully in guarding his nest - another reproductive trade-off, this time between adult survival (to be able to breed again) and progeny survival (the male successfully passing on his genes to the next generation). By comparison with fish that don’t guard their nests, all bullies would, on the criterion of investing effort in protecting their brood, be classified as K-selected. But note that this energy investment is by the male, and so has no influence on the amount of energy that the female can invest in producing eggs (producing milt by the male is a relatively low-energy affair). Thus, although the two types of bully life history strategy help us to understand the principals involved, it is a rather more complex matter, and sometimes misleading, to just classify “species” as one or the other, r- or K-selected - hence description of the differences as a “naive dichotomy”.

Among New Zealand’s bullies, the upland bully, on the face of it, is the most K-selected species. It has the largest eggs, up to 3mm long (long, because bully eggs are oval, not round), and it has relatively few of them - just a few hundred, depending on the size of the female. Compare this with the several to many thousand eggs only about 1mm long in the redfinned bully. But remember that whereas upland bully fry hang around the river and lake margins, a relatively safe environment, those of the red finned bully head off to sea, and are the targets of predators, get swept far and wide in ocean currents, and suffer heavy mortalities before a few find their way back into the river mouths. But, in the end, both are successful, doing things well in their own way. Both, of course, indulge in nest guarding while the eggs develop.

One of the features of r-selected species is that often they do well as invasive species. They can occupy new environments, or take advantage of disturbed habitats, as after fire, or around the fringes of dominant habitats like forests, or swamp margins, or in the analogy of stream ecology, after floods or droughts. They produce lots of young that can invade these situations rapidly and take over. Sometimes they are referred to as “weed” species for obvious reasons. However, the upland bully, though it apparently exhibits K-selected attributes (few large eggs and nest guarding), is very good at invading disturbed habitats. Often in the high country, we encounter streams that have nearly dried up. All that remains at the end of summer are a few marginal pools with warm water, and often filled with green filamentous algae. Pottering around in these pools will often be lots of tiny, young-of-the-year upland bullies that have hatched over the summer. When flows return, these are just waiting to invade the greatly increased area of habitat that suddenly becomes available to them, without competition from other fish species – often, in these streams, upland bullies may be the only species present. We could think of them as a “weed” species that is quickly able to occupy ephemeral habitats.

Furthermore, the Canterbury Plains are covered with a network of stock-water races that take water from the larger rivers and distribute it across the plains to provide water for stock. These races are full of upland bullies.
As we try to describe the “characteristic” habitats of upland bullies we find it quite difficult - they occur in the margins of large rocky rivers, in small streams, in drains, around the margins of wetlands and lakes, and from sea level (despite their name “upland” bully) to sub-montane lakes almost anywhere. The species begins to look like a “weed” species on the basis of its distribution and very wide habitat preferences, even though it seems to be a K-selected species on the basis of its life history strategy of producing few large eggs.

This looked to be something of a paradox, so we did some breeding trials. We captured a pair of small upland bullies from the Avon River in Christchurch - two fish about 50mm long caught in October, which we thought were probably the young from the previous spring spawning and so about a year old. We set them up in a tank in the laboratory and watched what happened. We knew that they were likely to breed in captivity as this has often been reported, and so they did. Within a week or two of capture, the male had established its territory beneath a flat tile we put in the aquarium and went dark black, a sure sign that spawning was imminent. There, one day, was the layer of eggs beneath the tile in the territory with the black male vigilantly guarding his brood of eggs, the female banished into a corner of the tank and not allowed anywhere near the nest. We knew that in the ovaries of female bullies there are usually two size groups of eggs, and so half expected that in a week or two, or perhaps longer, the female would mature again and spawn again. So we watched the pair with interest. In a little more than two weeks, the pair had spawned again, under the same tile, and so the male was committed to a further period of guarding as the next hatch developed and hatched. What then rather surprised us was that the female matured and spawned again about every 15-20 days during that summer, for a total of four batches over the summer. More was to come.

We retained some of the young that hatched, and reared them, as well as what we called the “pioneer pair”, over the winter, and set up about 12 tanks each with a pair of fish in it, to see if what we had observed was normal. And so it proved. The pioneer pair picked up where they had left off the autumn before, and by October were back at it. And they continued to spawn, again every 15-20 days right through until towards the end of February in their second year and produced no less than nine batches of eggs that spring and summer. The “progeny” pairs performed variably, but similarly, giving between one and eight batches of eggs - several producing five or more. There was quite wide variation in how many times and how often they spawned.

Obviously, the upland bully is capable of producing a very substantial annual crop of eggs, Because of limits in the number of large eggs a female can carry at once owing to her small size and the large egg size, she increases egg production by extending the spawning season, producing one clutch of eggs after another, and spawning repeatedly. It was interesting that egg size in each female gradually declined with each spawning presumably as the energy need to produce yet another batch of eggs accumulated. The male, it seems, just “tags along” and will breed as often as there is a female in spawning condition nearby. By contrast, as far as we know, redfinned bullies spawn only over a brief period in the spring - perhaps twice, and breeding may be over by about the end of November.

Thus, we seem to be in some difficulty in classifying the upland bully as r-selected or K-selected. Looking at egg number and size, and by comparison with the redfinned bully, it is clearly K-selected. In the trade-off between egg number per spawning and egg size, a female contains relatively few large eggs, and sacrifices egg number for egg size. In contrast, a female redfinned bully has lots of small eggs and sacrifices size for number. In the end, if population size is to remain stable, a pair of either species will, on average, produce just one pair of reproducing progeny in their life time, and to that extent each strategy is equally successful. However, the upland bully has cunningly compensated for its reduced number of eggs per spawning by evolving the ability to produce up to at least eight batches of eggs per summer, so that it is capable of producing quite large numbers of larger eggs.
Here, I think, is the key to the obvious success of this little fish. Whatever the circumstances in its habitat over summer, within a week or two it is able to produce more young to populate habitats that become available after summer drought. Some batches may be a total failure owing to streams partly or largely drying up, so the little fish do it again, and again, and again, and so the habitat continues to carry populations of upland bullies, even though few or no other fish are there.
1.4 A fish lost and gone forever

*Fish and Game 22, 1998*

NIWA scientist R M McDowall traces the extinction of a unique, beautiful, highly edible fish species – the New Zealand grayling – and surmises that it’s possible trout and deforestation may somehow have played a contributing part in their disappearance.

Sir Peter Buck (or Te Rangi Hiroa, to use his later given Māori name) was arguably New Zealand’s greatest anthropologist, active during the first half of this century. Recognising this, the Royal Society of New Zealand recently struck a medal commemorating his life and work, a medal that is awarded periodically to individuals who have made a major contribution to the field of anthropology. Buck had a very varied career, initially training in medicine and then briefly becoming a Māori Member of Parliament for Northern Māori. There, he joined Apirana Ngata and Maui Pomare, and some credit these three leaders with inspiring the beginning of the renaissance of Māori culture and society in the early 1900s. However, Buck soon became fascinated by the history of his people, and of the peoples of the tropical western Pacific. He began working in anthropology, and ended up as Director of the famous Bernice P. Bishop Museum in Honolulu, Hawaii.

Among Buck’s interests was Māori knowledge of New Zealand’s freshwater fishes, and he wrote two significant papers on the traditional ways Māori used to catch them. In the early 1920s, he went to the Waiapu River near East Cape and asked local Māori if they would show him the traditional methods that they used to catch the upokororo, or grayling (*Prototroctes oxyrhynchus*). They did so, building a weir in the small Waiapu River, and succeeded in catching no less than 30 to 40 upokororo. This event has significant interest in illustrating how Māori went about catching this fish. But of even more interest is the fact that this was the last time any significant number of grayling was ever reliably reported. There were occasional published reports later than this, though none was authenticated. A specimen was also given to scientists on board the British research ship Discovery when it visited New Zealand as a part of its worldwide oceanographic explorations in the early 1930s. However, this fish has no known locality or date of collection and could have been in Marine Department archives for years before that date.

The coincidental occurrence of (i) Buck’s request for a grayling weir to be built (ii) the capture of such a large number of grayling (bearing in mind that the fish was migratory and only present in rivers during some months of the year) and (iii) this being the last definite report of the species, are some of those moments of serendipity that defy explanation.

The Māori name upokororo is said by some to mean head (upoko) full of brains (roro), but whether this idea has any validity in Māori history and linguistics is far from clear at present. The Māori word is quite familiar to some, especially those who live in western Southland, since there is a river that carries the name upokororo – a tributary of the lower Waiau, though some historians suggest that the river that correctly carries this name is the Eglinton, which drains from Lakes Gunn and Fergus, near the Hollyford Pass, down into the upper reaches of Lake Te Anau. Attachment of the name to a river can presumably be interpreted as meaning that the fish was found there.

As must be becoming obvious, the grayling is extinct, and has been since the 1920s, or 1930s at the latest, and is the only native freshwater fish to have suffered this fate. Occasionally, since the 1930s, there have been reported sightings of grayling; perhaps the most famous of these being in the late 1940s when labourers building the road through South Westland reported “grayling” in the Mahitahi River, near Bruce Bay. This resulted in Marine Department scientist K.R.Allen rushing south to see what could be found and he found nothing. And nor has anyone else. Most of the stories and rumours come from South Westland. For many years there was a Canadian farming near Bruce Bay who swore that he had seen grayling, but provided no hard evidence. Leading amateur freshwater fish biologist Gerald Stokell of the 1940s and 1950s never saw a live grayling, and is on record as suggesting that anyone who did should not tell the government because there would be a rush to the site which might then lose all its value as a refuge for the fish. From time to time I have met occasional individuals who claim to have
seen grayling, but they have all been very elderly, and all their information dates from the 1920s. So, it seems that it is extinct – sadly, like the miner’s Clementine, lost and gone forever.

I suspect that most if not all of the so-called modern records are actually of yellow-eye mullet which are not all that different in appearance from grayling, especially when in the water. I have seen shoals of mullet in the lower reaches of rivers, apparently feeding off the algal growth on the gravels of river rapids, and just as grayling were reported to do, the mullet shoals scatter and flee rapidly downstream from the rapids when disturbed. When it comes to writing about this fish, there are more questions than there are answers. What was it like, and what is it related to? What was its life history, migration pattern, diet and habitat preferences? Why did it become extinct?

One thing is certain: In the early years of European colonisation, the grayling was abundant. It was much favoured as a food by Māori and caught by them using a variety of methods. There is a fascinating anecdote in a book on Hawke’s Bay history of a group of Māori busily shearing for a farmer – until the word was out that the grayling were running, and they immediately downed tools and off they went to catch a feed. Thomas Brunner is most famous for the arduous journey he and some Māori guides undertook in the middle of last century down the Buller River from the lakes to the sea, and then down the west coast as far south as about Bruce Bay. Accounts of this journey include stories of him, or more likely his Māori associates, catching and drying large numbers of grayling from the Buller River, providing much-needed food for the travellers.

And there is report that a Taranaki angler caught over 1100 of these fish during one fishing season. Another anecdote relates how in 1869 a river-powered mill wheel near Upper Hutt ground to a halt, one morning, because the mill race was blocked with thousands of fish – grayling. But nothing like this been reported for many decades.

When the European settlers first arrived here they had a habit of transferring British names for animals and plants to species they encountered here, and so they soon were talking about catching native trout and minnows, smelt, eels, and, of course, grayling. Sometimes the adopted name was more or less appropriate, to the extent that the New Zealand species has a real evolutionary relationship to the British species, as was true of our “eel” and “smelt”. But sometimes there was no such relationship, and the transfer of the name, while appealing to the settlers, has caused much subsequent confusion, as is true of our so-called grayling.

The grayling was very similar to a large smelt, and very closely related to the smelt family (Retropinnidae). How big it grew is uncertain. There are reports of examples up to 1.5kg – a fish that would have been at least 450 mm long. The largest specimen in existence in museums measures 320 mm. The common name “grayling” might be interpreted as indicating some similarity to, or relationship with the northern hemisphere grayling, a trout relative. Nothing could be further from the truth, though there is an utterly fictitious drawing, supposedly of a New Zealand grayling, in a book called the Doomsday Book of Animals, in which the fish is shown as something more like the true grayling.

There is a very similar species in southeastern Australia, also called grayling, and this, with the New Zealand species, comprises the extent of the group. Fortunately, the Australian species still exists (though it is uncommon), and growing knowledge of that species helps us to fill in the wide gaps in knowledge about ours. Both species, as well as the New Zealand and Australian smelts, have a distinctive cucumber-like smell. In fact, the Australian grayling is sometimes called “cucumber mullet”, while our smelts are often known as “cucumbers”. One early report suggests that our fish did not have the cucumber smell, but others said that it did, and it is a curious fact that some people lack the ability to smell cucumbers owing to a genetic defect. And the similarity in the smell to that of a cucumber is not the product of an over-active imagination – studies of the chemistry of the smell in smelts and graylings have shown that it is exactly the same chemical that causes the smell in the cucumber. So, to put it simply, our grayling is, more or less, a smelt, and these Southern Hemisphere fishes are quite closely related to the Northern Hemisphere smelts (some of which also smell like a cucumber). Just as an aside, the name smelt has nothing to do with smell, in spite of the odour, but has its derivations in an
ancient, probably Old English, word smoelt, which meant silvery. And if I may pursue this digression for a moment, salmon and trout anglers might be interested that the term smolt, used to describe the stage when young salmon and trout migrate downstream in to the sea, has the same linguistic origins, and is, of course, the stage when these little fish become silvery in colouration. As another aside, occasionally it has been suggested that we should compensate for the loss of our grayling by introducing the Australian species. This idea does not seem to make a shred of sense, for why should the Australian species establish itself and be successful here if the causes of the extinction of our species are still operative, and likely even more apparent now than they were when the New Zealand grayling declined to extinction?

Colouration of the New Zealand grayling is uncertain. The Australian species is mostly a bright silver, with a dull olive-grey back and white belly. It has no distinctive markings. Descriptions of the New Zealand fish sometimes concur with the Australian descriptions, but there are other descriptions, and it seems likely that the fish’s colour varied with age and maturity. William Arthur, an early Otago surveyor with an interest in fish and fishing, said that it was “slaty brown on the back, passing in to slate blue on the sides and silvery-white on the belly which had patches of azure [blue], no spots.” The fins were described as “orange coloured, tipped with dark slate”, the cheeks “white ... with a golden tinge, also the belly”. Eminent early New Zealand scientist James Hector said that it varied “in richness of colour from a general silvery hue and brownish on the back [to] dark speckled brown on the back and a rich yellow, almost golden in tint on the belly”. And William Phillipps, the last person to pen a description based on two fish from the Tauranganui River, near Featherston, wrote that a “great deal of contrast is seen in the colour of the grayling which varies from a general silvery hue, slightly brown on the back, to rich red-brown speckled with grey and rich yellow, almost golden on the belly”. The painting used in this story, which I commissioned from natural history artist Pauline Morse, is our attempt to illustrate these colours, based on the above accounts, and a few others.

Where the grayling occurred is also uncertain, but it was found very widely, from at least the Waikato and Bay of Plenty in the north, south through Hawke’s Bay, Wanganui and Manawatu, around Wellington, Nelson-Marlborough, on the West Coast and in Canterbury, and in Otago and Southland. In all probability, it was New Zealand-wide.

Its life history is poorly documented. Colonial west coast surveyor Francis Clarke observed the young grayling returning to rivers from the sea, in the spring, amongst the west coast whitebait catch. While some have doubted the veracity of this observation, it is corroborated by the capture of whitebait-like juvenile Australian grayling doing the same thing in Tasmania. Otherwise, little is reported that has much reliability. Its occurrence in freshwater was apparently very variable, and it had a reputation for appearing and disappearing from time to time. This habit, combined with the fact that it seems to have been a very shy fish that fled into the depths of pools whenever disturbed, resulted in it being described as a “mystery fish”. Mostly, it was found in the lower reaches of river systems, but did move into the small gravelly tributaries, and perhaps laid its tiny eggs on the gravel beds of these streams. In all probability, the larvae hatched and went straight to sea, and stayed there for several months. Spawning sites and behaviour are unknown, even for the Australian species.

The grayling has peculiarities in its teeth and digestive tract that suggest that it may have been herbivorous, which is very unusual amongst closely related fish species. Teeth in the upper jaw are blunt, and in a very uniform comb-like row. These bite down onto a horny shelf that surrounds the lower jaw, which has very few teeth. I think it likely that these upper jaw teeth were used to scrape algae from the surfaces of stones on the stream bed. This is supported by observations of Māori, who described the teeth marks of the grayling in the algae (which they called reporepo) on the stones. This opinion is supported also by the fact that the grayling has an unusually long intestine. Most related fishes have only one loop in the intestine, whereas the grayling has two loops. Plant material is difficult for a fish to digest, and the elongated intestine probably improved the ability of the grayling to obtain energy from algae. Certainly, it consumed some aquatic insect larvae also, although whether these insects are consumed deliberately or are taken in along with the algae is not known.
With all of this background information, can we determine why the grayling became extinct? The answer is "Not with any certainty at all". It began to disappear very early in the European history of New Zealand, with concern being expressed about its decline as early as the 1870s. Anthropologist Elsdon Best discussed its disappearance from the Waikato by 1874, while William Arthur found it by no means common in Otago waters by 1884. There is similar talk for the west coast at that time. And there are various reports during the early 1900s of it being a "curiosity", of a resurgence in numbers for a time, and of the species being rare, though not yet extinct. And, as discussed at the beginning of this article, capture by Māori when demonstrating their fishing technique to Peter Buck in the early 1920s is about the last significant record.

Obviously, we ask: "Why? What caused this sudden decline of a once widespread and abundant species?" There is no simple or convincing answer. Introduction of trout has been blamed, often and widely. So also has deforestation. But it seems clear that grayling disappeared from areas where trout were either absent or not abundant. And they disappeared from areas where the forest has still not been removed. I think any explanation has to take into account the fact that the fish spent a part of their lives in the sea. This habit would have accentuated the damaging effects of other harmful impacts. Population ecologists sometimes talk of "sources" and "sinks". "Sources" are populations that produce an excess of progeny from their reproduction, whereas "sinks" produce a deficit. If the drain of the "sinks" on the overall population of a species greatly exceeds the production of the "sources" and if at the same time there is habitat deterioration that is having harmful effects on the "sources", then there is created a scenario for the decline initiated by habitat deterioration to be greatly exaggerated.

Trout may have had something to do with it, too, perhaps preying on the juvenile grayling and displacing the adult grayling from the pools. If, as I discuss above, grayling fed on algal mats that covered the gravel in streams, then deforestation could have had seriously damaging effects on the grayling's food. This could have been by stimulating a shift in the types of algae present on the stream bed from species that did well in the subdued light of forested streams to species that did well in bright sunlight - perhaps a shift from encrusting red and brown algae to filamentous green algae (ie, slime). Moreover, deforestation would have caused increased turbidity and sediment loads in the river systems, and this could have affected the well-being of the grayling. Beyond this, it is not possible to say much. The fish disappeared too fast and too soon to allow a rigorous evaluation of the process and to make possible an explanation that is both convincing and satisfying. We just don't know. And it's a shame that such a unique, beautiful and highly edible fish species has disappeared, given that there are so few species in the fauna.
1.5 What is homing?

Fish and Game 24, 1999

The idea that fish are capable of migrating back to their birthplace has been around for a long time, and now has wide acceptance at all levels of knowledge from popular to strictly scientific. It was not always so. When the concept of homing by salmon was first discussed by biologists, it generated all sorts of mixed responses, from: “Very interesting, but how do they manage it?” to “Impossible, there is no way they could!” And the concept continues to create much interest. At the human level, it has great appeal - the thought that fish have a “home” and that they can, and do, find their way back to it. And, of course, scientifically there are all sorts of really interesting associated questions from “How do they do it?” to “What does it mean for the evolution and ecology of the fish populations?” Current debate continues at the scientific level and there is a lot of misunderstanding at the popular level.

So, what is homing? For sensible discussion, we must all know what we are talking about, and when using the word must all use it in the same way, or we just end up “talking past each other”.

For homing to be biologically meaningful, there are some essential elements. Clearly, it involves a fish returning to a place where it formerly lived, i.e. going home. For the return migration to be of any interest, the distance return must be significant. We are not talking about a trout shifting downstream or upstream a few hundred metres, or even a few kilometres, and then returning to where it came from. It could easily do that by accident, by random movement or wandering around. And equally, there must be an element of deliberate “decision” or “action” of some sort by the fish to return, i.e. the homing migration cannot be just an accident of chance. Thus, let’s imagine a rainbow trout hatching into the Mangamawhitiwhiti Stream, a Tongariro River tributary. It makes its way downstream to Lake Taupo and grows there for a year or two, and then returns to the Tongariro River on its first spawning migration. Moving up the Tongariro, it ends up back in the Mangamawhitiwhiti Stream. Is that homing? Well, it might seem to be, at least superficially.

But we need to remember that probably many thousands of rainbow trout alevins hatch into the Mangamawhitiwhiti Stream every year that most of them make their way out into the Tongariro and down into the lake, and then eventually come back into the Tongariro to spawn - possibly just because it is the biggest river flowing into the lake. The Mangamawhitiwhiti Stream is one of only a small number of trout spawning tributaries in the Tongariro, and so it is highly likely that a trout that hatched there would find its way back into the stream, when mature, purely by chance. If that constitutes homing, then it is not a very interesting phenomenon, at least from a biological point of view. Who really cares if some return to their hatch stream if just as many, or even more, don’t? So the concept of homing really becomes meaningful only when a great many more fish that hatched in the Mangamawhitiwhiti Stream return to that stream to spawn than would be predicted by random movement of returning adult fish into the spawning tributaries of the Tongariro.

Moreover, something more than fish just finding their way into habitats of certain characteristics has to be involved. Homing salmon and trout are not just looking for any “good spawning water”, but for the spawning water in which they, themselves, actually hatched several years before. Quite aside from the question of deliberate and specific homing, it is quite conceivable that fish migrating upstream can interpret the nature of upstream tributaries on the basis of chemical characteristics of the water that flows out of them, that this will guide them in making choices as the move upstream, and that they can find good spawning water by doing so. This sort of behaviour is known, for instance, in whitebait. Different species of whitebait seem to migrate in response to different chemical and physical “cues” in the water. Work on whitebait migrations has shown that a mixed-species shoal of whitebait migrating upstream will partition itself by species according to the nature of the tributaries being reached - whitebait of kōaro will rarely move into the low pH, acidic, tannin-stained water that comes out of coastal forest, but banded kōkopu whitebait do so freely. Neither of these species will move into the rather warmer waters derived from coastal swamps, but demand cool water. Possibly these streams also
have lower oxygen levels, and other features that dissuade kōaro and banded kōkopu whitebait from entering them. But, inanga whitebait will do so freely. These differences clearly involve the fish getting guidance about where to go, and making decisions to do so, but this is not the same as homing. They are literally “following their noses” without there being any element of finding their way “home”, “home” being some place that they are familiar with because they have been there before.

Thus the element of active choice is really fundamental in returning home, involving the fish actually navigating their way back into the stream of their birth using some kind of memorised signposts to direct them. And, in salmonids at least, this is what they are believed to do.

Experimental studies have shown that salmonids are able to detect minor differences in the chemical composition of streams, and navigate their way home by smell (just like whitebait), but they are able to do this because they can also apparently both recognise and remember the olfactory characteristics of the stream in which they hatched and spent the early days to months of their lives. This seems incredible to us humans, for whom the ability to smell is one of the lesser sensory modalities with which our evolutionary heritage has equipped us, but it is true. Experimental work which involved blocking the sense of smell of migrating salmonids has shown that, without that sense, they cannot find their way home, but with it they can.

Of course their homing is not 100% accurate, and some fish do get lost. But there is overwhelming evidence that far more fish are returning to the spawning grounds on which they hatched than could be explained by chance alone. And studies have shown that decision after decision, as the migrating fish reach branching points in the river systems, they are able to make the right one to get them to the right place. It is not just accident or chance.

There are other elements that could be guiding the fish that are not strictly homing. One of these is known as “kin recognition”. This involves a hypothesis that fish go to a certain place because they can detect the smell of other individuals of their own kind somewhere upstream. That is not homing because if you shifted the “kin” that were being “recognised” from one stream to another, then the fish returning on the basis of kin recognition presumably would go to the second. You could say that fish migrating to a location on the basis of kin recognition are going to a “family reunion”, wherever that might be being held, rather than going home. By contrast, fish that are homing are literally going to a place that is “home”, to a location that they recognise and remember whether or not kin are present.

Sometimes, it seems, this homing is so accurate that the fish can return to the actual spawning grounds where they developed and hatched. It seems that each stream, and even some specific locations in streams, have their own distinctive olfactory imprint - a unique combination of smells that derive from the primary origins of the water, as well as from the rocks and sand, organic material in the substrate, from the vegetation on the banks, from animals that live nearby and presumably from fish that live in the water, and that the fish can remember this imprint and find it again, after years away. Extraordinary? Yes, but lots of the things we discover in nature leave us dumbstruck at their elegance, sophistication, and complexity.

Why do they do it? Why did such an elegant mechanism evolve in fishes - at least in a few fishes, since it is only a very small minority of species for which homing has been proved with any certainty. Homing must have evolved because it gave fish that did so a selective advantage - that those fish that could home left more progeny than those that didn’t. Because of their greater number of progeny, successfully homing populations of the species came to dominate, and those that couldn’t became a minority and eventually disappeared altogether.

Why might homing be advantageous to a fish species? There are some simple, obvious, and interesting reasons. The fact that a fish has hatched from its egg, survived early life, and moved away to grow, mature and then return “home”, shows that there was something about the locations at which it hatched and had early growth that contributed to its success, i.e. its parents chose a good spawning site. Parents that chose the best spawning sites are likely to have had the greatest hatch percentage, and thus potentially release relatively more young into the stream. Given that this is so, it makes sense
that its progeny should go back to the same place (i.e. “home”) to spawn its eggs, which presumably also will have the same greater success. Simply, fish that spawn in “good” locations are likely to leave more progeny than those that spawn in “poor” locations. And if both groups of progeny do home to their natal spawning grounds, then those that go back to the “good” locations will, first of all be more numerous than those that return to a “poor” location. Secondly, not only will fewer of the latter return to spawn, but they will have lower success when they do (just like their parents did), and the differential will quickly be compounded. So, it is not hard to see how, very rapidly, a combination of accurate homing and the differential survival of eggs spawned in good and poor locations, will lead to the species as a whole homing back to good spawning sites.

That alone is enough reason to make homing a highly beneficial behavioural attribute. But there are others. Different habitats have different physical attributes. These different physical attributes may favour different adaptations in the fish that live there. Imagine, for instance, that one stream is very swift-flowing with coarse substrates, but another is slower flowing with finer substrates. Larger fish may have better ability to dig spawning redds in the swift-flowing, coarse, bouldery substrate stream than small fish. If that is so, there will be selection for larger size in the swift-flowing stream. But the slower-flowing stream may be shallower, making it more difficult for large fish to remain upright and swim there, compared with small fish. Studies by American salmonid biologist Tom Quinn, who is working with Martin Unwin, showed that large size disadvantages salmon in some shallow streams because their large size, and difficulty remaining upright, makes them more vulnerable to bear predation. Hence, there would be selection for smaller size in the slow stream. Moreover, fish spawning in fine substrates were shown to have smaller eggs. These are examples of the sorts of “stock differences” that North American salmonid biologists are discovering in the complex and varied river systems of the Pacific Northwest - each tributary seems to have its own, specially and locally-adapted stock that has evolved locally, to give the stock the best chance of survival, locally. And the reasons for differential spawning success are almost as varied as biologist’s imaginations (or even more varied). There are instances where large size in males is important because there is within-species competition for females, and bigger males are better able to mate with females than small ones. Sometimes this advantage leads also to the development of exaggerated sexual dimorphism, with males developing much more elongated jaws and grossly humped backs (making them seem even “bigger”). But in locations where large size is a disadvantage, as in shallow spawning streams, large size and exaggerated sexual dimorphism are less evident.

Salmon stocks that spawn a long distance upstream from the sea tend to be characterised by large size. Why? It is thought that this is because larger fish have better success in making the long upstream migrations. They can carry more energy in the form of body fats to sustain them. They are better, for instance, at climbing falls and making their way through torrents. Not only are they better at migrating, but the bigger females also have more eggs. So, if there is heavy mortality during the very long migrations (sometimes thousands of kilometres), better survival by larger females, with a greater potential to produce large numbers of progeny, leads to selection for large size. There are costs, though, because to grow to a larger size, the females have to live for longer in the sea, so mortalities during growth to maturity may be higher. The fish have to balance these costs and benefits, as the river-specific stock characteristics evolve.

Why bother going all that distance if migration costs (further mortalities) are higher? It is hard to be sure, but the upstream spawning grounds may be more stable, or there may be fewer predators, or the river systems may provide a very large amount of habitat between the spawning grounds and the sea for the young fish to feed and grow in, thus enhancing their survival, and perhaps making the young fish larger and better able to withstand predation when they migrate to sea. If upstream migration and spawning was not a successful life history strategy, homing would mean that the fish would not be spawning there.

Homing success is rarely 100% accurate. On the face of it, this might simply be that it is predictable that a few fish make mistakes, and maybe that is all there is to it. Well it probably isn’t. It is probably important for a species’ survival that homing be less than 100% accurate. Why? Because it gives the stock the
chance to capitalise on new habitat opportunities. For example, in Alaska, as climate is warming, glaciers are retreating, and new streams are forming that eventually provide habitat suitable for salmon to inhabit. If homing accuracy was 100%, then these streams would always remain devoid of salmon. But the small error rate in homing, and it is probably just a few percent, does give the species the capacity to disperse into new habitats, and there is probably adaptive value in that. Work by Alaskan salmonid biologists is showing that migratory fish species are finding these new streams and are colonising them. It will be some of the few percent of strays that are doing so. Moreover, if there was 100% accuracy in homing, this would make the stock highly vulnerable to catastrophe. If there was a major rock fall that temporarily prevented the fish from getting upstream to the spawning grounds, or there was a major volcanic eruption that made the rivers toxic and uninhabitable (as there was a few years ago on Mt St Helens in the Pacific Northwest, or Mt Ruapehu even more recently), then, again, an entire stock might be completely wiped out. But having a small percentage of fish that strays means that the stock survives. A few fish straying is an adaptive strategy that might have short term costs but long-term advantages. Evolutionary ecologists call this “bet hedging”, and is a way of describing some of the compromises between alternative strategies that are widespread in nature. Virtually all strategies have some costs and some benefits, and as long as the benefits exceed the costs, that strategy is favoured by natural selection.

A small percentage of straying has been a crucial element in the colonisation of salmon in New Zealand, and also for their management. When Chinook salmon were released into our rivers during the early 1900s, for a good number of years all the releases were made into the Waitaki River. It was presumed (hoped?) that once the fish had become established there, they would spread through the sea along the coast to other rivers, and colonise them also. What happened showed that this presumption was correct. Most of the fish that returned from the earliest releases returned to the hatchery on the Hakataramea. But some strayed and colonised other parts of the Waitaki River, and very rapidly, Chinook salmon were being found upstream throughout the river system. Moreover, some didn’t return to the Waitaki at all, but entered other east coast South Island rivers further north, and in only a few years salmon were found in the Rangitata, Ashburton, Rakaia, and Waimakariri Rivers, as well as smaller rivers like the Opihi and Ashburton. Eventually, they spread as far north as the Wairau.

Homing maintained the pioneering Waitaki River, but straying meant that other rivers were colonised. A little bit of straying is enough as long as rivers into which the strays migrate are suitable enough for salmon to continue to maintain their populations, and, of course, always assuming that the fish that initially strayed into these rivers produced stocks that then began to home there, which is what happened.

This has really important management implications for our salmon stocks - there is enough straying to suggest that any river systems in which long-term conditions for salmon reproduction and survival are good, are likely to develop their own salmon runs, just as a result of straying. If rivers do not now have runs, then the message they seem to be giving us is that it is probably not worthwhile to try and establish populations there by making hatchery releases. And past results support this idea. Huge numbers of salmon were released into the Wairau (Marlborough) and Hokitika Rivers during the 1930s, millions of them. The result? Intermittent and rather stuttering salmon runs in both rivers that probably have little or nothing to do with the original, massive, and long-lasting releases. Straying was probably enough to populate both rivers. A variable run persists in the Wairau, but what controls its size isn’t known. I suspect it may have something to do with the sub-tropical convergence in the sea off the east coast of New Zealand, the position of which shifts from year to year, and my hunch is that runs in the Wairau may be better when the convergence moves north and seas off the North Canterbury-Marlborough coast is cooler. But that is just a guess.

Salmon have been recorded occasionally from many parts of New Zealand - as far north as the Hokianga Harbour, in the Bay of Plenty, Hawkes Bay, and widely in rivers of the southern North Island. NIWA scientist Martin Unwin’s research has even shown that a salmon tagged and released into the Rakaia ended up in the Grey River on the West Coast. If one tagged fish is known to have done this, who knows
how many others also did the same, unobserved? Moreover, how many of the fish that were observed in West Coast rivers like the Grey, or in rivers all over the country, were wild, untagged fish that had strayed from the east coast? Of course, we do not know. Salmon have spawned in some of these rivers, and salmon smolts have been observed in some, such as the Rangitikei. But no significant salmon runs have developed there. You would think that the smolts that emigrate from the Rangitikei River would home back there as spawning adults. They may have done so, but presumably there have been so few surviving through to adulthood and returning to spawn that no consistent run has developed there, or virtually anywhere other than the eastern South Island. There seems no reason why salmon spawning should not be successful in the Rangitikei, and other rivers - trout are successful enough - and the problems are probably at sea. Former government Minister of Agriculture and Fisheries, Duncan MacIntyre, long had dreams of salmon runs in the Mohaka River in Hawke’s Bay. And that is one river where there have been strays. But it seems that this could never be more than a dream, just as it was only a dream of Clive Barker’s that he could develop a salmon run into the Takaka River in Golden Bay (though a nightmare for those who provided the cash to try and do so, year, after year, after year … ).

Homing is not a genetic attribute, in the sense that the fish do not use genetically provided guidance to find their way home, i.e. although the ability to distinguish odours and to navigate using them, is an inbuilt, genetic (“hard-wired”) attribute, the actual homing migration itself is not hard-wired. This might seem a fine distinction, but it is a really critical one. Homing fish are not genetically programmed to find their way home, they are genetically programmed to be able to find their way home. It is just like the human ability to see. That is a genetic attribute, something that we were born with, and we can find our way home because we can see. But we don’t find our way home just by seeing. We find our way home by looking - looking for familiar objects or signposts which we remember that we saw when we were there before! We navigate our way home using our sight to inform our brains and memories that then guide us home. In much the same way, homing fish navigate their way up rivers to their natal spawning streams mostly, it seems, using their noses, their sense of smell, to inform their brains and guide them home.

Salmonids transported from the northern to the southern hemisphere - brown trout from Great Britain and rainbow trout and Chinook salmon from the Pacific coast of North America - home in New Zealand just as they did in the north. This would be surprising if homing behaviour was genetically driven - how could they find their way in a foreign land? But homing is not a genetically given ability to find a location, but an ability using olfaction, that results in behavioural patterns that are an explicit response to local conditions, and the persistence of homing by trout and salmon is no more surprising in New Zealand rivers than it is where they originally came from. And homing is so well entrenched in our populations, that Unwin and some American colleagues are showing that our Chinook salmon stocks have probably become genetically adapted to our river systems after less than 100 years here. If there was free and random movement of fish between the various rivers, the gene flow that this generated would probably have prevented the development of such river-distinct stocks. But stocks do seem to have developed, and this can in part be attributed to homing fidelity. I would never have guessed that in just 100 years, salmon here would have evolved so rapidly, and given the amount of straying that there is between the rivers, that distinctive stock characteristics would have developed as Unwin and his colleagues have shown. But they clearly have.

The presence of homing has all sorts of interesting local implications. Take the diversion of water from the Rangitata River into the Rangitata Diversion Race which carries water across the foot of the Southern Alps, and discharges water, when not needed for irrigation, into the Rakaia. This means that there is water flowing out the mouth of the Rakaia that carries some of the distinctive odour of the Rangitata. And, in autumn, when salmon are migrating, if there is water flowing from the RDR into the Rakaia, large numbers of salmon make their way into the RDR discharge channel at Highbank. Are these really Rangitata fish trying to find their spawning grounds in Deep Stream, in the upper Rangitata? Quite probably they are. Well-meaning fisheries managers see these fish futilely accumulating in the channel with nowhere to go, and nowhere to spawn. So, at great effort and some cost they are netted out of
the channel and released into the Rakaia. Where do they go then? No-one knows. What happens if they start to interbreed with locally adapted Rakaia fish? Does this lead to a breakdown of the distinctive, locally adapted characteristics of the Rakaia stock? Perhaps it does, and maybe it would be preferable if they were trucked south and released into the Rangitata. Similar issues of mixing water from different systems have been raised about proposals to take water across the Canterbury Plains from the Rakaia, with surplus to be discharged into the Waimakariri or Selwyn Rivers, and similarly proposals to use Waimakariri River water to augment low flows in the Ashley. Perhaps there is more innate wisdom, than we have credited, in Māori objections to the mixing of waters from different catchments!

The whole idea of homing, once accepted, has developed lots of “warm cuddly” appeal. People marvel. Just imagine these fish finding their way home! What a fascinating and remarkable story. As a result, there has been a local tendency to assume, or at least suggest, that homing takes place also in other migratory fish. I read recently a description of elvers (juvenile eels) “homing” when migrating upstream in the Whanganui River. Homing? But they have never been there before. These elvers hatched far away in the sub-tropical western Pacific, and when migrating up stream are heading towards some location about which they know nothing, of which they have no experience, or memory, and to be frank, they don’t know where they are when they get there, if that makes sense. They are certainly not “homing”, and nor are they “home” when they get there. Rather they are “immigrant settlers” colonising a new land. They are just using instinct to migrate up stream and find suitable habitat. “Ho me”, if there is any such thing, is thousands of kilometres away in the sub-tropical western Pacific. Homing has got to involve an element of return migration to somewhere formerly inhabited. Otherwise a migration is not homing.

There is, from time to time, much talk of homing in whitebait, and one aquaculture venture is underway in northern New Zealand based on the expectation (perhaps hope, or dream, might be a better description) that whitebait larvae released to sea to feed and grow will return to the release site. To the extent that the whitebait larvae have hatched in a freshwater system, and so have some experience of it that could form the basis for a memory-based navigation back “home”, homing is theoretically possible in a way that is untrue of eels. But, we need to remember that inanga whitebait don’t actually develop in water, but in the air amongst the damp vegetation on the banks of the estuaries. They are immersed in their “natal” water, after hatching, for only a few minutes - and that mixed with sea water - as they are swept to sea. And they do this when only about 7-8mm long. Though they have all of their “body parts”, and can presumably smell, it seems to me to be little short of far-fetched that they have both the ability to home, and that they are in fresh water long enough to give them the capacity to do so when they return to freshwater some six months later. Other evidence also is germane to this question. There are, for instance, whitebait runs into rivers where there is no known spawning habitat, sometimes big whitebait runs. If these fish are “homing”, what spawning grounds did they come from and are they homing towards? Whitebait clearly choose what water they migrate into (of which more in a later article), but I suspect that they do so by choosing preferred water types, and perhaps kin recognition has a role in attracting them. If I am wrong, and aquaculture of whitebait based on a homing migration is feasible, then I’ll take off my hat to both the aquaculture entrepreneurs who are risking their money, and also to the whitebait as even more amazing little animals than I already think they are. But, I am not holding my breath.
1.6 See how they run

*Fish and Game* 26, 1999

Leading fish scientist Bob McDowall investigates whitebait migrations and discusses the many variables that actually make these small fish head into our rivers from the sea. He shares information gleaned over decades of research that will interest keen whitebait fishermen.

The fisherman's truism “you should have been here yesterday” probably applies more aptly to whitebaiting than to any other sort of fishing. The runs are so variable from day to day and river to river, and you just never really seem to know when the little beggars are going to run. People who seem to regularly be there when the runs are full on are usually the same people who have also invested long hours on the river bank when they aren't running. But surely there must be some pattern to whitebait migrations. It can't be just a random thing. Nature is usually not so unpredictable and lacking in pattern.

There is pattern - a whole series of interacting cycles that influence the whitebait migrations - daily tidal cycles, day-by-day cycles and seasonal cycles, and variations from year-to-year.

It is common knowledge that you go whitebaiting on the rising tide - almost anyone knows that. Get there as the tide starts to make, stay there until it peaks, catch what you can and then usually it's time to go home, get warm and dry, drain the catch and put it in the fridge (or cook up a feed while it's super fresh before the relatives find you have a bundle!). There's another tide tomorrow. Well, almost everyone knows that. But there are exceptions, for example, when there can be good catches on a falling tide. Sometimes this is a result of unexplained idiosyncrasies relating to specific river systems, and exploiting such situations depends on local knowledge. There is, however, a more general circumstance that is really interesting. Whitebaiters sometimes report big runs on a “back (falling) tide” early in the morning. This happens when high tide is an hour or two before dawn, and experienced whitebaiters know to get their nets in the water at dawn (you aren't allowed to fish for whitebait at night, of which more in a moment). What is happening is not absolutely certain, but I think the explanation is as follows. As I have already commented, it is common knowledge that whitebait run on the rising tide. I think the entry of whitebait into many rivers from the sea is strongly influenced by the surge of water entering the river mouth from the sea as the tide rises. This surge quite possibly actually carries the fish into the estuary, and certainly whitebaiters fishing at the mouths of large rivers are well aware that often all you have to do is hold your net into the upstream sweep of the rising tide (if you are strong enough) and the whitebait will find their way into your net. There is no reason why this should not happen at night as in the day. If that is correct, then, it seems reasonable that the whitebait are swept into the estuaries at night. If the high tide is, say, at midnight, then in all probability the fish just get swept out again as the tide falls. But, if the high tide is just before dawn, then the fish are still in the estuary as the tide starts to fall, and the onset of morning light is enough to get them migrating upstream. And so they can be caught, and often are by knowledgeable whitebaiters and sometimes in large quantities.

I commented about migrations at night. It is my experience that whitebait don't migrate at night - at least that is the picture I have developed after having used experimental traps to catch the fish, night after night after night in a major South Westland whitebaiting river where catches are high. Typically the catch during darkness was negligible, just a few fish, but catch would pick up in the morning as the sun rose and it became light. I am aware that there may be some situations where this may not apply. The whitebait fishing regulations prohibit fishing at night, and it might seem logical that it would not be necessary to ban fishing then if the fish weren't running. Perhaps! However, I know of no authentic and quantitative information that demonstrates whitebait runs at night, and have a mass of experimental fishing that shows that it doesn't.

Apart from the fact that normally whitebaiting is done in the day, and on the rising tide in any day, many whitebaiters swear the most influential daily variable is the lunar-monthly tidal cycle, and plan their whitebaiting to be at the river mouths on the high spring tides. Possibly, again, there are some locations where this is true, but my analysis of catches by experienced professional whitebaiters from several South Westland rivers, where the runs can be huge, gives no support for this idea.
I could find no statistical relationship between the whitebait catch on these rivers and the height of the
tide - and this was from a mass of data, including records of all catch for two rivers over a total of about
40 years, and for six other rivers over four years.

The moon, and the spring tides that are connected to the phases of the moon, seemed to have no
connection to differences in the number of whitebait migrating, and catches could be just as big on a
neap tide as on a spring tide. My analysis indicated that the big runs were mostly associated with floods.
Until there was a decent flood some time during August or September, there was no whitebait run of
significance in these southern rivers, and the first good run of the season usually seemed to occur after
the first good flood of the spring. Subsequent pulses in the catch also followed later floods - though not
always. Sometimes there were pulses in catch not closely associated with floods, and sometimes there
was no pulse after a flood.

However, often enough, catches began to rise as a flood abated, reached a peak a few days after the
flood, and then fell away to low levels and stayed there until there was another flood.

This pattern had interesting implications for the West Coast whitebaiters who used to build enormously
long stands across the margins of the big rivers. Up until reasonably recently, stands there could have up
to six nets, and the stands could extend up to a third the distance across the river. So whitebaiters built
these structures that snaked across the sandy gravel flats of the river that often were dry at low tide,
but flooded at high tide. And they placed numerous vertical screens on the stands with gaps between
for the six nets, so that the fish moving upstream hit the screens and headed into mid-stream until
they encountered an apparent gap - with a net in it to catch them. Particularly in South Westland, the
nets had sophisticated traps in them, so that the fish once in could not get out. These structures were
cunning and effective “fishing machines”.

Cunning, perhaps, but they were fragile structures usually built of saplings cut from the forest and driven
into the river bed, with a narrow catwalk on top threading its way towards mid river. They were very
vulnerable to floods, and so were often destroyed or seriously damaged by them. Thus there tended to
be a recurring cycle of:

• lower catches over a period of days or even weeks
• resulting loss of interest by whitebaiters
• a sudden flood with whitebaiters poorly prepared to deal with the flood’s impacts
• damage to the stand with loss of gear, poles knocked over or broken, catwalks fractured, and
  sometimes nets and screens demolished or swept away down river
• then, abatement of the flood and the beginning of the whitebait runs simultaneous with frantic
efforts by whitebaiters to get their gear back in order was hindered by difficulties in building a new
  stand in a river that was running high
• finally whitebait stands back in full action just about in time to see the runs decline back to their
  former low levels.

The wiser whitebaiters learned of this cycle of changing abundance and focused on ensuring that their
gear was in the best possible condition to both survive a flood and be in action as soon as the flood
abated and the whitebait began to run. However, some whitebaiters, it seemed, never learned and
could never win.

Why this changing abundance? We really don’t know and can only surmise. Several things change when
a river floods. One is that the mouth of the river gets “blown” open - the major flow of water out of the
river creates a much larger mouth. Clearly, there are cases when this is important as some river mouths
nearly close after long periods of low flow and the whitebait shoals experience difficulty actually getting
into the river estuaries as they begin to run upstream. In addition, the greater volume of water in a flood
means there is a much larger “plume” of fresh or low salinity water moving out to sea. This probably
attracts the whitebait seeking a river to enter, and draws them into the river mouths in larger numbers.
It seems very likely that the principal cue that the whitebait are looking for is fresh water, though we can
at present only guess.
The whitebait do not necessarily wait until the water is clear before they run. This was dramatically demonstrated for one South Westland whitebaiter one day in the mid 1970s. He was a very experienced whitebaiter - few people will ever have caught as many whitebait as this fellow. And, fishing a river where access was poor, he was waiting around during a flood with nothing much to do, got a bit bored, and so put his net in just to see if there were a few fish running. There were. Although the river was still distinctly in flood, with the water quite dirty, he found that whitebait were entering his net faster than he could bail them out. Over a period of two days, he landed around half a tonne of whitebait – 500 kilogrammes. Recall, I am not writing about last century, or the 1920s and 1930s when legendary catches of whitebait were taken, and when there were stories of whitebait used as fertiliser, and whitebait fed to the chooks so much that the eggs they laid had a fishy taste. I am writing of the 1970s – modern times when the whitebait fishery is supposed to have faded away to insignificance.

The seasonal cycle is another variable. Most whitebaiters I have talked to reckon the peak of the season is around Labour Day – lateish October. I'm not sure why they think so, but suspect that most whitebaiters catch more whitebait because they have a three day weekend to go fishing. Cynicism aside, there clearly is an annual/seasonal cycle in abundance. Even before there were whitebait fishing regulations and an official whitebait season, it was common knowledge that you catch whitebait in the spring. Māori knew this perfectly well, long before European settlement, and in fact Europeans probably learned it from Māori. Today, the whitebait season is roughly August through November, with local variation prescribed by the regulations. But it was not always so, and July was once officially approved for whitebaiting. This timing of the seasons essentially recognises when most whitebait are running. On the West Coast, the season is shorter and lasts only through September, October, and the first half of November. Regardless of when the season opens and closes, observant river watchers will always find whitebait running before the season opens - “buckets” of them they say, moving up river, or shoals streaming up after the season closes. It is true, of course, and maybe it’s just as well because if there weren’t runs that the fishermen could not exploit there probably wouldn’t be any fishery at all. However, it is hard to tell just how big these out of season runs are, and I suspect that they probably don’t usually amount to all that much. A shoal of a few kilograms of whitebait moving upstream unmolested by whitebaiters probably looks like a lot of whitebait when observed by someone on a bridge longingly looking down at the fish streaming past, and wishing he could be catching them. That said, there certainly are times, outside the fishing season, when whitebait are running, and from my understanding, these can occur at any time. I have taken fresh run whitebait from rivers in all 12 months.

Finally, there are differences in catch from season to season. Some whitebait seasons are good and some aren’t. When they are, whitebaiters are happy and conservation is often far from their thoughts. When runs aren’t good, suddenly gloom prevails and there is passionate talk of the need for conservation, though usually nothing much gets done. What’s going on? Well, although there are plenty of theories, as far as I can tell, we really haven’t a clue. It could be that too many fish were caught last season and a shortage of ‘breeders’. Or it could be summer drought caused adult mortalities and again a shortage of ‘breeders’.

I recall Robbie Nolan, a life-long whitebaiter of Okuru, near Haast, passionately expounding his favourite theory that drought in autumn killed the whitebait eggs laid on river bank grasses, or was it that floods during autumn smothered them with silt? I’m not sure which now. There can be little doubt that marine productivity has its influence, as it would affect food availability for the whitebait larvae, and this would affect their growth and survival. Whitebait are sometimes bigger or smaller than “usual”. Moreover, it could be the patterns of oceanic currents around the New Zealand coast that affect the ability of the whitebait to find their way back into our rivers. To be honest, I don’t know which of these is true, and don’t know anyone who does. Furthermore, it is likely that all of them are true, some more than others, perhaps one or more of them, together, and in varying degrees from year to year.

So, when predicting whitebait runs, we cannot tell how good a season it will be. We can get some guidance as to when in the year it is best - the whitebait regulations are a pretty good guide - go whitebaiting when you are allowed to.
On a week-by-week basis, I strongly recommend you follow river conditions and go out in the few days after a good flood. And, of course, go whitebaiting on the rising tide on any day. With all that information, you have a start. But when the crunch comes, one variable you have to learn for yourself is where you put your net. That takes local knowledge. There are two ways to learn - watch an experienced or successful whitebaiter, but you need to be careful about trying to flog his possie by getting there early tomorrow. People who do that often get a wetting. Or you can learn where to fish effectively by experience. That is far more satisfying because, if you are observant, you can begin to understand the principles that control whitebait migration paths along the river bank, and thus learn to identify the sorts of places likely to be productive.

Once learned, that sort of information can be applied on any river. Like any sort of fishing, successful whitebaiting depends partly on persistence, and partly on developing some knowledge of the skills needed and the behaviour of the fish.
1.7 Fish of the Falklands

_Fish and Game_ 30, 2000

**Renowned freshwater fish authority R M McDowall visited the Falkland Islands to undertake funded research on its fish. What he found, including a thriving brown trout fishery, may surprise New Zealand anglers.**

The Falkland Islands are not typically everyone's choice for a vacation or tourist trip, but for almost as long as I have studied the freshwater fishes of the southern cool temperate zone (southern Australia, New Zealand, the sub-Antarctic Islands, Patagonian South America, and the tip of southern Africa), the Falkland Islands have been a place I have wanted to visit. These remote islands are very much a part of this southern cool temperate zone and so their fish fauna is of strong interest and highly relevant to New Zealand. Moreover, brown trout have been introduced there, anglers are showing increased interest in the islands, and it was interesting to see how the native fish had fared since trout were introduced.

The islands have always been familiar to Kiwis - some shearers go there for a period each year, and scattered across the islands are people from New Zealand who talk nostalgically of home. And like New Zealand, Falkland's traditions and culture derive in large measure from Britain, even though the islands are much smaller than New Zealand, and much of the immigration is more recent. So Kiwis have much in common with the Falklanders.

The Falklands are at around 52° ¼ S in the southern Atlantic Ocean, (about the same latitude as Campbell Island to the south of New Zealand), and are around 500 kilometres east of southern Argentina. There are two main islands, but around 700 islands altogether, with an area of about 11,000 square kilometres. Being so far south, and right in the path of the roaring forties and fifties, the wind really blows, even though there is some shelter in the lee of southern Argentina's Andes mountains.

Stanley, on the eastern side of East Falkland, has about 2000 people and is growing as locals move into town from the countryside. Otherwise (apart from the military), there are only a few hundred people thinly spread in small farm-based hamlets across the islands. Outside Stanley there are only two or three shops – simple ones at that. It would be easy to imagine that the islands are impoverished economically, and sustained by a flow of resources from Britain, but we were told that this is untrue. The economy was long based on sheep farming, entirely for wool, as there is no significant market for meat.

New roads are making a huge difference to life in the Falklands, but the down-side could include some significant impacts on natural values, impacts that need to be watched with care. These roads provide quite easy access around the islands, added to which the natural vegetation of the Falklands includes no trees - nothing bigger than a small shrub which may reach a metre in height, so there is no forest, nor any firewood, but extensive peat-beds provide fuel for heating. Thus, it is possible to drive widely across the countryside, in much the same way as it is possible in the sub-alpine heathlands of the central North Island, or the Mackenzie Basin and central Otago.

In recent years, the Falkland's economy has been substantially lifted by development of marine fisheries in territorial waters – a big squid fishery plus various ‘wetfish’ species. Resource rentals, from mostly foreign fishing companies, inject millions of dollars into the Falklands' economy each year.

Perhaps surprisingly, tourism is an increasingly significant part of the Falkland's economy, as people come for bird-watching (penguins and albatrosses), and for trout fishing. We found the people just fantastic. We went there to catch fish and caught lots, but came back also with rich memories of warm hospitality among friendly people toughing it out in a robust and sometimes bitterly cold environment. The winds, at times, make a Wellington southerly seem like a gentle zephyr. Scenically, the islands resemble the Mackenzie Basin, except that there are no very large mountains. But quite steep hills reach around 700 metres and there are some significant ranges of hills. Much of the countryside we would perhaps describe as ‘downlands’ – gently sloping, rolling hills. These are vegetated mostly with what the locals call ‘whitegrass’, a dry, stringy, wind-shorn grass less than 30 cm long, and appearing to contain
minimal nutriment. And there are diverse low shrubs, vegetation reminiscent of the Desert Road plant communities of the central North Island, including a species of Hebe also found in New Zealand, as well as occasional familiar-looking ferns.

Bird life is quite sparse, in a way, though we saw lots (not many species, but some of them abundant). Their ‘upland goose’ is reminiscent of our paradise shelduck, and is abundant, widespread, tame, and probably the strongest single, natural bio-ecological influence on the islands. They were everywhere, so common that bird faeces lay dried in the wind all over the place, and we were told that there is enough nutrition left in it for the sheep to actually eat it (unlike Canada geese which New Zealand farmers tell you stop sheep from feeding owing to excrement on the pasture). Upland geese are hunted heavily and their eggs are taken as well. We saw lots of almost tame, tiny grebes, various ducks, other goose species, teal, large menacing hawks, brilliant-crimson breasted thrushes, snipe, and tiny wrens in the grassland. Virtually all the land birds also occur on the Patagonian mainland. And, of course, around the coastline is one of the world’s great assemblages of penguins and sea birds. The only native mammal, a modest-sized fox, was extinguished by hunting many years ago.

I, and two colleagues - Richard Allibone, a fisheries scientist with NIWA in Hamilton, and Lindsey Chadderton, a conservation officer with the Department of Conservation – went there to survey the islands for freshwater fish fauna. Our trip, which cost around NZ$25,000 in total excluding any salary costs, was funded primarily by the National Geographic Society in the USA and the Shackleton Scholarship Fund, a Falkland Islands/British charity, with additional contributions from the New Zealand Government, NIWA, and the Royal Society of New Zealand.

Our goal was to determine what freshwater fish species are present in Falklands streams and lakes. I was interested to know this so that I could integrate this knowledge with my wider knowledge of related fish faunas in other southern lands.

It is not a matter of coincidence that all these areas of the globe are places where galaxiid fishes are found, again including the Falklands – a group of fishes that has been the principal focus of my research since I began whitebait studies in the early 1960s. Freshwater fishes were first collected at the Falklands, possibly by none other than Charles Darwin (or his assistants), when he was on his now legendary voyage around the world on the ship Beagle, captained by Robert Fitzroy, later Governor of New Zealand, in the mid 1830s. Although there have, from time to time, been additional small samples of fish collected from the islands, work on the fish fauna has always been incidental to other things being done, and no-one had previously undertaken a systematic search.

We wanted to cover the islands as widely as possible, and were fortunate in being able to use the new network of roads. After a few days’ orientation in Stanley, we set about trying to cover the islands’ freshwaters as thoroughly as we could in three weeks. Historically, four freshwater fish species have been reported from the islands. One is Galaxias maculatus – and if you are wondering, yes, it is the same fish as our inanga – although they have no whitebait fishery. In addition, they have ‘zebra trout’, a galaxiid-like fish also present in Patagonian South America, and which reaches about 400 mm. The zebra trout was formerly highly favoured as an ‘angling’ fish, and I heard stories of large numbers being caught by locals in an afternoon – 50 to 60 fish seemed to occasion no surprise. The locals would catch them, and sometimes cook them over a small fire on a clean shovel (it’s a long way to McDonalds). Soon after we arrived, I met a fellow who had a bundle in his freezer, gutted and headed, caught the previous Christmas, and he gave them to me. They cooked up quite nicely, despite 10 months in the freezer, with white, firm, tasty flesh. Zebra trout have become rare and localised, so that we never saw the sorts of numbers needed to catch so many. However, when we did find them in the streams, it became obvious why they were so easy to catch. They would sit, unfrightened, in a small, open, shallow pool when we approached, and would readily take pieces of meat tossed into the water as we watched. Had the meat been on a hook, capture would have been simple and rapid.

A third fish species, described in 1905 as Galaxias smithii, but which I think is the same as the Patagonian Galaxias platei, has never been recorded there again, and so was a fish that we hoped to find. There is
also one record of the pouched lamprey, *Geotria australis*, and again the same species as is found in Australia, New Zealand, and South America. And, of course, perhaps there may have been further “new” species not yet discovered – always a chance when exploring a new area. Basically we worked across the islands using the road network as a “base”, and moving out across the grasslands wherever we thought there might be interesting streams or lakes. We used varied gear – generator-powered electric fishing, seine nets, dip nets, gill nets, and traps. Although our target was primarily fish, it seemed to us that we ought also to collect aquatic insects and bugs at the same time, since these, too, are scarcely studied and there could be much of interest to find. And so we collected bugs as well. Day-by-day, we drove and fished, from site to site – 146 sites in three weeks.

Most of the streams are small and easily wadeable. We probably saw no river that we could not wade somewhere, though there are some “respectable” small rivers. Sometimes the substrate was bed-rock, but there was lots of hard-rock boulder/gravel. The streams seemed stable, totally unaffected by human development, the water brown, and probably acid. The bottom fauna is extremely impoverished. There are lots of amphipods (small crustaceans), chironomid midges are common, and here and there we found caddisfly and stonefly larvae (two species of each are recorded). No mayflies are recorded, though I saw one adult on the surface of a small stream.

Some mayfly nymphs in one of our bug samples turned out to be a New Zealand species, and we have a haunting suspicion that they may have been contaminants from a net used in New Zealand. There’s an interesting question to resolve, for if the species does occur naturally on the Falklands, that would take some explanation in bio-geographical terms. There were other “odds and ends”, such as water mites, a few snails, leeches, water beetles, and so on, but, by comparison with New Zealand, very low diversity and very low abundance. In fish biology terms, not much for fish to eat.

The Falklands have a growing reputation as a destination for trout fishermen, and we soon found why. We met members of the Malo Angling Club, and read stories about their fishery, telling of brown trout, introduced in the late 1940s, up to 10 kg, and we talked to one fisherman who had taken one of nearly 9 kg a few weeks before. These huge fish are not freshwater resident, but seem to feed and grow in sea inlets that characterise the Falklands’ coastline, and move into river estuaries on the rising tide each day. I caught one, but it was a puny 2 kg and did not rank. In addition to these huge fish, some rivers have numerous smaller resident browns, mostly less than 1 kg, occasionally bigger, and we heard stories of anglers catching 50 to 60 of these in a day. Lively sport in some ways, but mostly they seem in poor condition, owing to the sparse food available in Falklands’ streams. This explains why they are so easy to catch. They are basically very hungry and grab almost anything! We caught one small brown in a stream a few metres downstream from a dead sheep, and it was full of blowflies. Sheep getting stuck in streams is common because the streams are often narrow and deeply entrenched, with no sloping banks that enable an animal to scramble out – a legacy of the unspoiled Falklands’ countryside. Good for trout, it seems.

Brown trout were introduced in the late 1940s, with stock from Chile, along with small batches of brook char and rainbow trout. Further brown trout were obtained from England and Scotland, only the browns becoming established. Those familiar with the early introductions believe that the earliest introductions were from stream-resident stock, and thus expected them to stay in the streams into which they were released. However, they did not understand the way brown trout, of whatever “stock” origins, always seem to have individuals that move to sea. There appears to be a deep-seated instinct in brown trout to “smolt”. As in New Zealand, this resulted in natural spread around the Falklands. Some argue that this natural spread disproves brown trout homing, but that is not so. It seems that most fish do home, but a few stray, to assist invasion of new habitats. That clearly happened in the Falklands, although some later introductions included stock from known “sea trout” populations. For whatever reason, and from whichever introduction, brown trout are now widespread. There are still some areas that they have not penetrated, particularly southern East Falkland (which locals call Lafonia), and also some streams draining into almost enclosed inland seas with narrow connections to the open sea, such as Philomel Harbour in the west of West Falkland. My guess is that, with time, brown trout will spread almost everywhere.
We heard quite a lot of “rainbow trout,” though knew of no published evidence that rainbows had ever become established and it is hard to imagine them in the streams. It took a while to work out that Falklands’ “rainbow trout” are strongly coloured and brightly pigmented resident brown trout that we were catching everywhere. That the locals regard them as a different fish from the silvery sea-migratory browns in the rivers is not surprising. Thus, the brown trout is the only freshwater fish species successfully introduced to the Falklands, although there was some years ago an embryonic salmon farm rearing Atlantic salmon. It seems that some entrepreneur had visions of diversifying industry there. However, costs of obtaining fish meal to feed salmon, plus freight costs of getting product to markets make it unlikely that the Falklands can compete economically with nearby Chile in salmonid aquaculture. It was even once suggested that waste mutton, in the absence of a market for old ewes, might provide the food for salmon production, but this seems unlikely to be a viable means of producing salmon, simply for dietary reasons. Feeding salmon in salmon farms is a sophisticated, “high-tech” business these days.

The Falkland Island streams tend to be rather “black” – a consequence of draining peaty soils and vegetation – and their low productivity means that fish growth is probably slow. The blackness of the streams may be accentuated by the low rainfall – around 600-800mm a year. But there must be ample spawning gravels, as we found heaps of small trout. One local landowner discussed getting rid of small stream browns to encourage better growth and bigger fish for angling, but our tour indicated that reducing the populations would be expensive and unending. This fellow’s attitude was, however, a refreshing change from the endless clamour for more hatchery stocking in New Zealand. In practice, it seems to me that the real basis for the productivity of the brown trout fisheries in the Falklands, and particularly of the huge size of the fish that anglers can catch (up to 10kg), is that many of the fish go to sea, where they grow rapidly and fat on the crustaceans and small fish that abound in the semi-enclosed fiord-like seas that are a feature of the Falklands coastline.

So there is a quite diverse trout fishing opportunity for anglers. Rivers are privately owned, and angling is not cheap, guides are necessary, and accommodation is also expensive – expect to pay around $150 per day in a comfortable and very hospitable, but rather simple country lodge (everything provided, though guiding is additional). The Malo Anglers Club kindly let us use their lodge. It was very basic. We would call it a hut, but it was still under construction, and was entirely suitable for our purposes. Moreover, it cost us nothing (we would have been paying $150 a night, each, in a commercial lodge), and provided access across northern East Falkland.

Angling in the Malo River nearby, much of it in the lower tidal reaches, was enhanced by the availability of what Falklanders call “mullet” - a fish unlike our mullet, and which is a species of Antarctic nototheniid cod (not too distantly related to New Zealand’s ‘Māori chief’, and looking like our blue cod - but it grows much bigger, reportedly up to 60cm and 10kg). These mullet are primarily marine, but move into estuaries on the rising tide in large numbers and are easily taken on any kind of spinner with some red colouration. A bronze toby with a bit of red insulation tape fastened to it worked fine. I caught three or four in as many casts. Hundreds of these fish come into estuaries on the rising tide and are fun fishing. They are strong swimmers, and dogged fighters, don’t jump, but “bore” off into midstream strongly, and take some landing, perhaps behaving like kahawai, but growing substantially bigger. And the flesh is firm, white, and tasty (much better than kahawai).

So, what freshwater fish did we find? Inanga, which the locals call minnows, were very widespread, both sea-migratory populations in lower reaches of the rivers, as well as landlocked populations in many of the very numerous small lakes and ponds. Zebra trout have reputedly become much more restricted in range in recent decades and we confirmed this. This is a handsome fish, with golden cheeks and strong olive-black chevron-shaped bars across the sides. And we found brown trout almost everywhere. Rumour had it that we would find zebra trout only where there were no brown trout, and this, too, is precisely what we found. Basically, as in New Zealand and Australia, the native Falklands’ fishes seem to have been seriously displaced by the spread of brown trout. To put some numbers on this “allegation,” over the three weeks we were working there, we sampled 146 different sites. Of 130 sites where any fish
were encountered, we found only inanga at 57 sites (many of them inland lakes that are still trout free), only zebra trout at three sites, only brown trout at 45 sites, inanga plus zebra trout at 13 sites, brown trout plus inanga at 10 sites, zebra trout plus brown trout at no sites at all, and all three species at only two sites. Moreover, at the two latter sites – locations where brown trout and zebra trout co-occurred – we could find only one zebra trout in each case. The message seems clear: brown trout coexisted with native fish at only 12 of the 130 sites where there were any fish at all. Native fish and brown trout have largely complementary distributions and the circumstantial case for displacement of native fish (and especially zebra trout), by brown trout is strong. Fears expressed by local naturalists about decline and potential disappearance of zebra trout, as a result of brown trout introductions, seem justified. Centres of survival of zebra trout appear restricted to areas where, for some reason or other, brown trout have not yet managed to penetrate. It seems inevitable that brown trout will eventually reach nearly all localities where zebra trout are still found, and so serious is local concern about this fish that it is now totally protected. We shared that concern.

As for *Galaxias smithii/platei*, we found no trace of it and were left wondering whether the original collection site specified as “Falkland Islands” was an error. Nor did we find any evidence of the pouched lamprey. Its presence in Falklands’ streams would not cause surprise, as it spends several years at sea, occurs widely in South America, and has been reported in the food of albatrosses taken around South Georgia, which is another south Atlantic island south and east of the Falklands.

So the native freshwater fish fauna of the Falklands is small – to all intents and purposes just two species, the Falklands’ minnow and the zebra trout. That is not too surprising, given the fact that the islands are so far south. The freshwater fish fauna of Patagonian Argentina and Chile is little more diverse (and both Falklands’ species also occur in Patagonia). Moreover, the isolation of the islands in the far south, glaciation as recently as the Pleistocene, (10,000-15,000 years ago), the really impoverished “bug” fauna to provide food for fish, and the generally sparse ecology of the lakes and streams, means that it is a somewhat “robust” environment for any fish to thrive in.

Life in the Falklands seemed quite tough, but the people appeared to be loving it. So did we, for three to four weeks! We were lucky, I think, that the locals quickly understood why we were there, accepted this, the word got around the islands rapidly, and they seemed as keen as we were that our visit would be successful. Lively support from the staff of the Falklands Department of Environment and Planning, and Falklands Conservation (a private foundation) certainly made the whole trip easier and more successful. Both agencies seemed to do everything they could to make it so. If you are getting the feeling that we had a good time, you would be dead right! But we worked hard, had long days, and I, at least, came home exhausted, but exhilarated. A trip of a lifetime, with yarns that could go on all day (and night).
1.8 Matching your catch

*Fish and Game 34, 2001*

Respected authority and keen angler Bob McDowall helps whitebaiters identify species in their whitebait nets.

For me, one of the more interesting aspects of the ever-changing whitebait runs is a change in the species composition of the catches. Some whitebaiters seem unaware that there are several species in their catches, while others are all too aware of this, to the extent that I have heard talk among whitebaiters of up to 19, or even 25 different species being present.

In fact, there are five distinct species of whitebait caught in our fishery. There are some hints in the early literature that naturalists had recognised that there was more than a single species involved in the fishery, but on the whole mostly it had been thought that the fishery is based on the returning of juveniles of the inanga, *Galaxias maculatus*. And in many areas, this is by far the predominant species in the catch and sometimes the only one. However, it is not always so and some years ago several events transpired to alter the perception that there was just a single whitebait species.

I recall, soon after beginning work on whitebait for the former Marine Department in Wellington in 1963, that Jock Moreland, long-time Curator of Fishes at the National Museum in Wellington, phoned me and suggested that I have a look at some whitebait for sale in a local shop in Cuba Street. He thought that there was something odd about these fish that was not immediately understood. At about the same time, I had arranged for Eric Midgely, foundation whitebaiter in the Awarua River in Big Bay, South Westland (since 1949), to keep samples of his catch for me. Moreover, at that time we were also undertaking a monthly sampling programme for inanga in the Waikanae River north of Wellington. Each month we would survey three sites in the lower Waikanae River. The first of these was just below a former weir that was constructed just downstream of the main road bridge (sited there to stop the bridge piers from being eroded by the river during a flood). It seemed that whitebait in the river could not get upstream past this weir which was about two metres high. As we prepared to begin sampling at each monthly visit, Keith Maynard (our electric-fishing technician) would test the machine to see that it was functioning properly, just above the weir, before clambering down to begin our first sampling site. Generally, we caught no whitebait above the weir, but I vividly recall that in August 1963, for the first time we caught quite a number of small whitebait among the cobbles along the river margins upstream of the weir.

As we looked at them it was obvious that they were not inanga whitebait and we wondered what they were. They seemed smaller and more slender and they sat on the bottom of the bucket with their pectoral and pelvic fins spread out like rounded, flat feet. I cannot recall that they attempted to climb out of the bucket, though that is another distinctive characteristic of these fish that we have since come to know well. Identifying them was a problem, but we eventually were sure that they were the young of banded kōkopu (*Galaxias fasciatus*) and kōaro (*G. brevipinnis*). Over the following year or two, by widespread sampling and by rearing of fresh run whitebait through to the subadult stages in captivity, we became certain that there are two additional whitebait species, giant kōkopu (*G. argenteus*) and shortjaw kōkopu (*G. postvectis*) for a total of five species in the catch. No more and no less (ignoring the second class whitebait of the Waikato River, which are smelt (*Retropinna retropinna*) which no self-respecting West Coast whitebaiter would regard as “whitebait” for a moment).

Once the identity of whitebait had become clear, I became involved in a programme of exploring the composition of the catch in different rivers around the country and put together a kit to show whitebaiters the different sorts of whitebait juveniles and the various adults that they grow into. It is an understatement when I say that many whitebaiters thought that I was some kind of nutter when I showed them the large, bulky fish that I was now quite sure whitebait grow into. Many of them just did not believe it and said so to me directly. I often wondered what they and others said behind my
back! My usual response to that was to admit that I might be a nutter, but that in spite of that there are five different sorts of whitebait that grow into five different adults, some of which were large, bulky fish. Even now, nearly 40 years after this discovery had been well publicised I still encounter lots of people who don’t know that some whitebait grow into various of the kōkopu species, and kōaro, as well as inanga, though gradually it has come to be accepted that we were right. Now I sometimes find people telling me that there are five different sorts (the ultimate test of our “information transfer” is that scientific discoveries become “common knowledge”). But the unknowing or disbelievers are still out there and I encountered one such just over the Christmas vacation, a farmer from the upper Grey River valley, who fishes for whitebait in the Poerua River south of Hokitika. We were talking about banded kōkopu and kōaro which he often gets in streams in the bush on his farm, and I said: “Do you realise that they are grown, adult whitebait?” To which he immediately retorted: “No!” Sorry Stewart, the answer is “Yes!”. But getting the information across has taken persistence and time. Some years ago a well-known science columnist in the Listener wrote an article on whitebait which he headed Battered Fishes. His article was full of all sorts of misinformation and long-outdated statements, and so I wrote a reply to the editor and titled my letter Battered Knowledge - which was not much appreciated by the somewhat aggrieved columnist, who argued somewhat petulantly that he could not be expected to have all the latest information. Well… if you are in the business of popularising science (and making money from it), I rather hold the opinion that you ought to be sure of your facts. Frankly, I thought he was lazy and sloppy.

Anyhow, that spat aside, and for the information of the probably many who I know are “out there”, and who have still not caught up with this information about what whitebait grow into (although the work I am writing about has its origins over 40 years ago) here is some information about what whitebait are and what they grow into.

Whitebaiters are usually well aware of the relationship between the whitebait that they catch and the small greenish and silvery inanga that they often get in their nets, especially later in the spring when early run whitebait have had time to feed, become pigmented, and take on the somewhat more stocky body form of the subadult fish. Many whitebaiters swear at them as they have to tediously sort out the “gutty bait” and many are not aware enough of their role in reproduction to carefully put them back in the water so that there are “spawners” there to produce next season’s run. The more ignorant of them just toss them in the bushes or feed them to their dog.

The prospect that whitebait could grow into much larger, bulkier fish like kōaro, or the three kōkopu species has often been quite difficult for most whitebaiters to grasp. It is not that the whitebaiters have been unaware that there are several species in their catches - as already noted, some have claimed to recognise up to 25 different species. But the more astute whitebaiters, certainly, have distinguished the large, rather soft and milky whitebait of the kōaro without ever connecting it to the adult fish. And they often know that soon after floods, when the water is still turbid, or in the more turbid snow-fed rivers like the Arawhata, Haast, and Whataroa, there are a lot more of these milky fish. Some whitebaiters called them “run-bait” because often they are common at the beginning of the whitebait run that may develop as a flood abates. And many, too, recognise that this species is very adept at climbing and will climb up the walls of their buckets, trying to get out. Their pectoral fins stick out each side just behind the head and some whitebaiters call them “elephant’s ears”.

Kōaro whitebait also survive longer after they are caught than other species and this has interesting implications for the selling and buying of whitebait. When a fisherman tips his catch for the day into a perforated tin and leaves it to drain for a while, what often happens is that the more vigorous kōaro whitebait work their way to the top of the tin and eventually tend to form a layer of rather milky-looking whitebait at the surface. These kōaro whitebait are less desired by the buyers than the clearer greenish-translucent inanga whitebait and buyers comment unfavourably on tins of whitebait that look to be largely kōaro. But, had they stirred up the tin of whitebait, then they would have found that it was only the top layer that was largely kōaro.
Many whitebaiters are also well aware of the whitebait of banded kōkopu. These are smaller than the other species and tend to have a slightly amber to golden colour, and some whitebaiters know them as “golden bait” for obvious reasons. They too are lively climbers and can climb out of the catch bucket. Late in the season, when whitebait of all species tend to be a little smaller than earlier, banded kōkopu whitebait may be small enough to get their heads through the mesh of the net and this, too, has been noticed by some of the more observant fishers.

When it comes to whitebaiters and giant kōkopu whitebait, there are several problems. One problem, of course, is that few whitebaiters can believe that the large bulky fish we know as giant kōkopu, and which grows to 400 mm or more long, could possibly be a grown-up whitebait. Another problem is that giant kōkopu are so rare in the catch that it is very difficult for any but the most experienced person to find them. And this is made even more difficult by the fact that it is very hard to distinguish them from the whitebait of the other species. With the shortjaw kōkopu it is even worse. They are probably even more rare in the catch and I don’t know anyone who can distinguish a shortjaw kōkopu whitebait from a kōaro whitebait. It might reasonably be asked, if that is so, how do we know that there is a shortjaw kōkopu whitebait. The answer is that we have brought fresh-run whitebait into the laboratory from the rivers and have reared them through until they are large enough for their colour pattern to develop sufficiently to be sure that there are shortjaw kōkopu whitebait.

Knowing that there are several species involved in the fishery provided fertile material for exploring differences in behaviour between the species. Specifically, different behaviours provide the opportunity to compare behaviours of the various species and so to identify the various factors that affect the migrations. Widespread catch sampling all over the country eventually showed that inanga, kōaro, and banded kōkopu are the principal species in the catch. Giant kōkopu run late in the season (usually after about the first week in November), and shortjaw kōkopu are so rare that it is unlikely that this species has much of a role in the fishery.

So, armed with this information, we began a massive sampling programme in the rivers of the Haast area to try and sort out the various aspects of river waters and flows that influence the runs. Bear in mind that speaking broadly, whitebait are the same all over New Zealand. Bay of Plenty whitebait are no different from Manawatu whitebait, or Canterbury, or West Coast, or Southland whitebait - at least as regards the species taken in the catch. The proportions of each species may vary from river to river, from area to area, and also during the season at any location, but it is one or more of the same five species you will catch wherever you happen to be. From our studies in the Haast area, we found that there were differences in the composition of the runs:

- between closely adjacent rivers
- within a river between successive years
- within a river under different flow conditions
- in a river with time of the year
- within a river at different sampling sites, and
- between various tributaries entering a river.

The challenge was to try and make sense of all these differences and see if there was a consistent pattern. Well to put it simply, there was and in a future article, I will outline these differences and attempt to establish a pattern that explains what causes the differences.
1.9 Another perspective

Fish and Game 36, 2002

Leading whitebait expert and regular contributor to Fish & Game New Zealand, Bob McDowall, has some doubts about the ability of whitebait to home. In this regard, he and Charles Mitchell apparently agree to disagree. In Issue 24 in 1999 in a story entitled ‘What is homing?’ McDowall wrote of his doubts. Some of his contentions are reproduced here.

Work on whitebait migration has shown that a mixed species shoal of whitebait moving upstream will partition itself by species according to the nature of the tributary being reached - whitebait of kōaro will rarely move into the low pH, acidic, tannin-stained water that comes out of coastal forest, but banded kōkopu whitebait do so freely. Neither of these species will move into the rather warmer waters derived from coastal swamps, but demand cool water. Possibly these streams also have lower oxygen levels, and other features that dissuaded kōaro and banded kōkopu whitebait from entering them. But, inanga whitebait will do so freely. These differences clearly involve the fish getting guidance about where to go, and making decisions to do so, but this is not the same as homing. They are literally “following their noses” without there being any element of finding their way “home” – “home” being some place that they are familiar with because they have been there before.

There is, from time to time, much talk of homing in whitebait, and one aquacultural venture is underway in northern New Zealand based on the expectation (perhaps hope, or dream might be a better description) that whitebait larvae released to sea to feed and grow will return to the release site. To the extent that the whitebait larvae have hatched in a freshwater system, and so have some experience of it that could form the basis for a memory-based navigation back “home”, homing is theoretically possible in a way that is untrue of eels. But, we need to remember that inanga whitebait don’t actually develop in water, but in the air among the dam vegetation on the banks of the estuaries.

They are immersed in their “natal” water, after hatching, for only a few minutes – and that mixed with sea water – as they are swept to sea. And they do this when only about 7–8 mm long. Though they have all of their “body parts”, and can presumably smell, it seems to me to be little short of far-fetched that they have both the ability to home, and that they are in freshwater long enough to give them the capacity to do so when they return to freshwater some six months later.

Other evidence also is germane to this question. There are, for instance, whitebait runs into rivers where there is no known spawning habitat, sometimes big whitebait runs. If these fish are “homing”, what spawning grounds did they come from and what are they homing towards? Whitebait clearly choose what water they migrate into, but I suspect that they do so by choosing preferred water types, and perhaps kin recognition has a role in attracting them. If I am wrong, and aquaculture of whitebait based on a homing migration is feasible, then I’ll take off my hat to both the aquaculture entrepreneurs who are risking their money, and also to the whitebait as even more amazing little animals than I already think they are.

But I am not holding my breath.”
1.10 Like a thief in the night

Fish and Game 37, 2002

Recently, smelt have been discovered in abundance in Lake Brunner. Given that Lake Taupo’s trout grow so large mainly on a diet of introduced smelt, R M McDowall examines the implication of smelt in Lake Brunner for its trout and for its stocks of kōaro and kōkopu.

Smelt (Retropinna retropinna) are generally credited with permitting the recovery of the Lake Taupo trout fishery after the condition of the fish had deteriorated seriously during the early 1900s. The trout had basically “eaten themselves out of house and home” by preying so heavily on the pelagic, lake-living juveniles of the once prolific-kōaro (Galaxias brevipinnis) population in the lake, that the condition of the trout had deteriorated seriously. Just how abundant kōaro were in the lake can be gauged from a number of historical comments. One is that the local Māori were reported to catch kōaro by the “hundredweight” with big seine nets hauled around the lake shores. Another is a painting by C.F.Angas, which shows Māori in a canoe catching whitebait from the lake with long handled dip nets – imagine trying to do that now. And further, Tuwharetoa historian J.te H.Grace wrote about how adult kōaro could be picked up around the shores of the lake after a heavy storm – they were washed ashore. And Grace relates that the people who did this were known as “kai panare” – those who picked up the food around the lake shore. Not anymore!

As a result of the collapse in the kōaro populations, many tonnes of poor-conditioned trout were netted from the lake, by government, as a remedial measure, though of course this could not be a long-term solution as the trout reproductive potential in tributaries of Lake Taupo is vast, and no matter what netting was done one year, the trout would be back the next, or perhaps in two to three years. So a solution was sought that would provide the fish with a sustainable food supply and smelt were taken from the lower Waikato River and liberated into Lake Taupo. Somewhat surprisingly, it worked. Despite the smelt coming from a sea-migratory (anadromous) stock in the Waikato, they became established as a landlocked population in the lake and can be credited with facilitating a recovery in the condition of Lake Taupo’s trout. They still, essentially, provide the “engine” that drives the fishery. Just why the smelt have been able to withstand trout predation, for decades now, in a way that the kōaro could not, is an unsolved mystery, but it seems clear that smelt can handle trout predation.

Acclimatisation societies from around New Zealand, knowing of the “smelt miracle” in Taupo, have sought similar “miracles” for their own fisheries – Nelson, Wanganui, Wellington, West Coast, and probably other societies did the fisheries equivalent of a “visit to Lourdes”! Smelt were obtained, usually from Taupo, and were released into lakes in several parts of the country over the decades, often unsuccessfully. One successful example was a series of releases into Lakes Poerua and Brunner – lakes on the West Coast that discharge, eventually, into the Grey River. Several smelt releases were made during the 1960s and early 1970s and it was initially thought that they had failed to take. However, eventually it became apparent, in about 1987, that a population had developed in Lake Poerua.

Now it seems they are also in Lake Brunner. Whether the Brunner population resulted from the initial releases into Brunner, as in Poerua, or from fish moving down from Poerua into Brunner, is unknown and it probably matters little. There had been some talk of smelt in Lake Brunner, and during the Department of Conservation’s pest fish survey during the summer of 2001-2002, fish sampling was undertaken in Lake Brunner. There had been anecdotal reports of carp in the lake and DoC was concerned enough to determine the identity of these fish. Seine net hauls around the lakeshore captured shoals of small, whitebait-like fish that were preserved and sent to me for identification. Almost simultaneously, I had reports of “huge shoals of whitebait” in Lake Brunner from anglers. As it happens, the fish netted by the DoC programme turned out to be smelt and my guess is that the whitebait seen by trout anglers were also these smelt. Without sampling them it is impossible to confirm or refute this – they could have been whitebait, as there are landlocked populations of kōaro (Galaxias brevipinnis), banded kōkopu (G. fasciatus) and giant kōkopu (G. argenteus) in Lake Brunner and all three have pelagic, open-water living, shoaling, whitebait juveniles.
If we accept that the fish seen by anglers were the same as those netted in the DoC pest fish survey, then it appears that a prolific population of smelt has developed in Lake Brunner. Whether the smelt have proliferated in Lake Brunner only in the last year or two, as might be implied by both reports and captures coming at about the same time, or whether the conjunction of these events was just a coincidence, is unclear.

No matter which is true, it would seem that the presence of smelt in Lake Brunner is great news for the trout if the Taupo “miracle” has anything to teach us. And anything that is great news for the trout is likely to be great news for trout anglers, especially in a lake like Brunner, where the trout can be in rather poor condition.

However, it may not be good news for the galaxiid population in the lake. Studies elsewhere indicate that when a prolific population of smelt develops in a lake, it can be bad news for Galaxias species, like kōaro, that have larvae and juveniles that live and feed in the open waters of the lake. Specifically, when smelt were (illegally) liberated a few years ago into Lake Rotopounamu, a little south of Lake Taupo, the kōaro population promptly disappeared. It seems likely that the following happened: the smelt live their entire lives in the open water of the lakes and both juveniles and adults prey upon small planktonic animals there. Each year, after the kōaro breeding season, a cohort of tiny larval kōaro (less than 10mm long) would move into the surface waters of the lake, to feed on the lake plankton – as they had been doing probably for centuries (given the position of Lake Rotopounamu, I would not be surprised if the kōaro were liberated there by local Māori at some past time). The smelt, liberated in Lake Rotopounamu, present in the open waters of the lake and much larger than the larval kōaro, would be in a good position to exploit the larval kōaro as food. And it seems probable that, at least in Lake Rotopounamu, they did this until kōaro were extirpated there – hence the concern that the smelt, good news for trout may be bad news for the kōaro in Lake Brunner. The same probably applies to the other Galaxias species mentioned above, which will also be producing pelagic, plankton-feeding larvae that live in the open waters of the lake. They, too, may suffer smelt predation.

Kōaro have “hung on” in Lake Taupo, despite having to cohabit with the introduced trout and introduced smelt, and cope with the predation of both, for decades. Whether they will eventually succumb to the combined predations of smelt at the larval stage and trout at the whitebait stage, only time will tell.

Will we ever know what develops in Lake Brunner? Possibly not, though perhaps in years ahead, when people go looking for the adults of kōaro, banded, and giant kōkopu in the tributaries feeding into Lake Brunner (and presumably also Lake Poerua), they may find that there are no longer any there. Will we find that, like a thief in the night, the smelt (now apparently well-established in Lake Brunner) have done their silent work and that the galaxiids have gone?

There is a cautionary tale here that those with an interest in the conservation of native fish would be well-advised to consider and this relates to whether, despite the benefits to trout, the liberation of smelt into New Zealand lakes has such damaging effects on the galaxiid populations in those lakes that we should turn to introducing smelt as a trout food only when other fish conservation values in the lake are unimportant. There are some interesting policy questions here for both conservation interests and trout fishery managers to address.
1.11 Wagging their tails

Fish and Game 41, 2003

In the light of our widely read Issue 36 feature by Charles Mitchell, “Whitebait Farming Anyone?”, expert R M McDowall looks at the prospects for whitebait farming.

My first memories of whitebait are of going to the lower Ohau River, near Levin with my grandfather to catch a feed. I recall sitting in the sun among the grasses along the riverbank and being told to sit still and watch for little fish moving upstream. "Watch", he would say, "and you'll see their tiny black eyes and their tails wagging behind them." And you could, if you looked carefully, and sometimes pick up the flash of a whitebait's tail. If the water was really clear, you could see the shadows of a whitebait shoal on the riverbed. Ever heard of "whitebaiters' eyes"? We'd often return with a pound or two and my grandmother would cook them for lunch – and I can still taste them, 50 or more years later.

Now, having spent 40 years studying whitebait and their relatives in New Zealand, Australia, South America, and South Africa, it seemed timely to review aspects of the fishery and what some think are prospects for whitebait aquaculture. I'm not sure that I agree with them.

The wild fishery seems in trouble. Years of poor catches in Westland (the most productive fishery) don't bode well for its future. But now and then we have a wonderful season and think maybe it's not so bad. Recently, South Canterbury whitebaiters made catches of almost west coast proportions. Why? We have no idea. The problems are that:

1. we don't know how much whitebait is caught on the west coast or elsewhere and,
2. we don't understand what influences catches from year to year. There are some who think they do, but I doubt it, especially in the absence of catch data.

Accompanying the decline in whitebait has been an increase in price and fish shops now offer whitebait at up to $9.95 for 100 grams. With reducing catches and rising prices has come interest in whitebait aquaculture. Surely, there must be something in it? I get phone calls from budding entrepreneurs planning a fortune in whitebait farming. Sometimes they are up front, but often their questions are vague. The questioner beats around the bush, bleeding me of my knowledge, without telling me why he wants to know. I know what's going on and usually I think he knows I know, but I play the game until my interrogator has found all he wants, or has reached the limits of my knowledge. Had a call from a fellow the other day, interested in farming kōaro. The money some people will invest in aquaculture on the slimmest of information astounds me. Recent publicity suggested that an experimental whitebait farm in northern New Zealand is the first ever. However, the Tasmanians conducted experiments in the 1980s without significant progress. And the Chileans have been doing research for some years. So, with this interest, it's timely to ask: Is whitebait farming possible and what influences success? The question has two aspects: (i) is it practicable? and (ii) if so, is it economic?

A "Yes" answer to the first question is useless if the answer to the second is "No". Nor is there much point pursuing whitebait farming if impediments make it impracticable. Let's look at the first question first, though I think it would be useful to do some "bio-economic modelling" of the economics, but, that's another issue.

There are five whitebait species, though the inanga predominates most of the catch, and let's keep things simple. The other species are much the same from an aquaculture perspective, though their technical problems will differ.

Key elements are as follows:

1. inanga spawn in shoals, in river estuaries in autumn, during high spring tides
2. the eggs are deposited among estuary-bank vegetation that is covered by water at the spring tides
3. after the high tide recedes, the eggs develop out of the water, taking two or more weeks, depending on temperatures
4. the eggs hatch at later spring tides when water floods the estuary-bank vegetation
5. the larvae are swept to sea, and feed and grow there for about six months
6. the whitebait return to river mouths in spring, over several months
7. those not caught move into lowland rivers and wetlands, feed and grow over summer, mature, and migrate to the estuaries to spawn, completing the cycle. Most post-spawning fish die.

Whitebait farming must either replicate each of these steps, or develop technology for side-stepping one or more of them. Whether these steps are replicated or side-stepped divides whitebait aquaculture technology into two types: “Replication technology” exploits natural processes, making use of migrations to sea, marine feeding and growth, and harvests the whitebait as they return. “Side-stepping technology” develops alternative answers to some of the seven points listed above, making the process possible in captivity. The Tasmanian and Chilean programmes use side-stepping, and one New Zealand programme has applied replication. Both approaches are possible. Each has its Achilles heel that needs to be solved to be successful. Remember that there are both technological and economic issues – uneconomic whitebait is no use.

Let’s look at side-stepping, beginning with mature adults, address the key issues, and review outcomes, focussing on the seven key elements, listed above.

- Once we have mature adults ready to spawn, we need to do one of two things - simulate or stimulate. To simulate we provide conditions that prompt spawning. In nature, this seems related to flood tides at new and full moons. Water level fluctuations in ponds can mimic the tide at the right moon phase and the fish may respond, and spawn. To stimulate, injecting fish with hormones stimulates spawning. Both are practicable. Don’t confuse “captive spawning” with females shedding eggs in captivity. Large, adult inanga will shed their eggs in captivity (often causing excitement) if stimuli for spawning are delayed too long, but I am unaware of instances where males have fertilized the eggs. So it is not true “spawning.” Unfertilized eggs are no use.

- There are issues to address related to developing suitable substrates for the eggs to be deposited on in the aquaculture facility, but this scarcely seems a major issue.

- That solved, getting the eggs to develop poses few technological problems – they will develop in a glass dish in the laboratory. There are issues to address, such as optimising temperature and light, but these seem manageable.

- Fully developed eggs will hatch when flooded with water, though the process needs refinement in a production technology; I see no problem here.

- Rearing the tiny larvae and getting high survival seems a significant problem, though it’s certainly possible. I’ve reared larvae well through development, though mortalities were high. Others have done better. But getting a reliable and nutritious source of food is a significant technical problem (that’s what the Tasmanians were looking at).

Producing food for tiny fish larvae has been accomplished in aquaculture for other species and is applicable to whitebait farming. However, whitebait farming has an unusual key element. Most farmers rear fish for harvest to a weight of several hundred grams, so that each survivor provides a significant quantum of edible flesh. Moreover, having overcome the difficulties of getting survival through sensitive small growth stages, aquaculture then exploits survival through periods of rapid growth – bigger fish are easier to keep, grow faster, and survive better. With rearing of whitebait, we just succeed in getting the fish to a size where survival is assured and growth rates are rising rapidly – and we eat them (at about 0.5 grams weight). So we terminate rearing just before the most productive period.

The Chileans have developed systems for small scale rearing of larval whitebait through to “harvest” size, though their rearing densities are low. I never met a Chilean who had eaten aquaculture-raised whitebait. When I asked about turning this into a commercial technology, they said: “We’ll multiply it up.” I doubt that it will be so simple, as new problems of both disease and water quality will emerge, though perhaps I’m wrong. Moreover, I’m not aware that the Chileans have addressed the economics question.
So rearing is possible at small scale, but high production seems another question, both practically and economically.

1) Harvest is a minor issue for side-stepping whitebait farming technology

2) Successful aquaculture requires broodstock maturing for spawning. Inanga are not fussy fish and are easily reared in captivity. Captive rearing can achieve greater than wild growth rates and a bigger female has more eggs. Egg production seems a minor issue. Though inanga typically die after spawning, in captivity it may be possible to nurse them back to health after spawning and get them to spawn a second time. If so, the growth already achieved will be exploited rather than lost and the fish may continue to grow even bigger and so produce even more eggs. Moreover, there will be less need to withdraw whitebait from sale-stock for broodstock. The Chileans get high mortalities of broodstock using hormonal stimulation and so need to keep rearing brood stock.

So reviewing side-stepping technology, apart from economics, the Achilles heel is getting adequate larval survival and growth, especially at a commercial scale. The Chileans have solved basic technological problems at small scale and it remains to be seen whether their technology can be scaled up. Questions of economics remain.

Looking, now, at the replication technology: some issues discussed above are the same, some of them different.

1) Issues of achieving spawning are as discussed above, though the choice between simulate and stimulate clearly points to simulate. Again, pond water levels can mimic tidal fluctuations and may achieve natural spawning. Or, the adults could be liberated to spawn totally naturally in the estuary of a chosen stream. There seem no insuperable problems here, though choices of where the mature fish are allowed to spawn seem important

2) Replication technology must focus on optimizing the spawning substrate – finding the best soils and plants for the fish to spawn amongst – largely a question of fine-tuning nature’s conditions

3) Once the eggs are fertilised, success relates to optimising conditions for development. Manipulating conditions may increase survival, such as spray-irrigating the eggs during drought, preventing floods from silting the spawning substrates, eliminating egg predators, and so on. These are questions of detail, but need to be addressed

4) As with side-stepping, above, hatching can be achieved by flooding the eggs with water and there seem no critical problems here

5) In a replication technology, the larvae go to sea to feed and grow. This has the huge advantage that there is no need for food production – the sea provides the food at no cost, and growth and survival are as good as in ordinary wild populations. However, mortalities are uncontrolled and unknown. Moreover, we don’t know where the larvae go in the sea and dispersal losses may be high

6) Replication technology involves natural return of whitebait to rivers from the sea and here there are huge uncertainties. We need to understand why whitebait return to freshwater and what guides them. Clearly, they have some physiological drive to move from seawater to freshwater. They tend to return after floods, perhaps guided by increased flows of freshwater out to sea. But what else guides them, and how they choose which river to enter, is little known, but we can explore the possibilities:

a. they may just choose the nearest river, almost at random

b. they may choose the river according to natural qualities of the water (such as temperature or pH) something in the water may signal suitable habitats upstream

c. or the fish may sense big populations of inanga in rivers, perhaps as a result of body-wastes of river populations being in the water; upstream-migrating whitebait may choose to join them, again on the assumption that habitats are favourable. This is known as “kin recognition” and has been suggested for our whitebait

d. or the populations of adults upstream may release specific chemicals designed to attract conspecifics (chemicals known as pheromones) like those used in traps for codling moths. Pheromones have
been suggested as attracting whitebait, but this work didn’t distinguish between kin recognition and pheromones (some think the difference trivial, but I disagree - different processes are involved). Pheromones remain a possibility. Both kin recognition and pheromones seem unlikely to be key elements in migrations of inanga whitebait as this species typically has an annual life cycle. By the time whitebait are returning most adults are long dead, and there is no strong freshwater population releasing chemicals into the water to guide returning whitebait back upstream.

e. or the fish may choose the river of their return by homing. Does the old nursery rhyme apply to whitebait (Little Bo Peep, if you can’t recall)? If we do leave them alone, will they really come home, wagging their tails behind them? To explore this question, we must clearly understand what homing is.

Homing involves the return to the habitat where the fish was born, as authenticated in salmon and trout, which return to their birth habitat, exploiting guidance cues based on the animal’s memory. They navigate back upstream using the odour of the water. Homing has been suggested in whitebait because they are “related to trouts and salmons”. Related, yes, but that relationship is very ancient (maybe 60-80 million years, or more), and this sort of “guilt by association” seems to me to be far-fetched. Can whitebait, hatching on riverbanks and washed out to sea in a few minutes after hatching, leaving freshwater at about 8-10mm long, really recognise their birth stream as salmon do – by recognising the “odour” of the stream? Some think so, but, as you will realise, I am distinctly dubious.

How does homing differ from other options discussed above? If return is based on kin recognition or pheromones (rather than homing), then if we removed the resident population of fish from the birth river (and so remove the source of any guiding chemicals), the up-migrating whitebait would not go there, but if they homed, they still would. If we removed resident fish from one river and released them into another, then if the whitebait were guided by kin-recognition or pheromones, they would go to the new river and not to their original (home) river. But if they were homing, as salmon do, then they would still go to the home river. So, guidance processes, and the outcome of migrations, are really quite, though subtly, different when kin recognition/pheromone guidance is compared with homing.

Does it matter if the final result is fish coming back? I think it does, for two reasons. Firstly to optimize the process, and make replication whitebait farming work, we must really understand it. Moreover, if guidance is by kin recognition/homing, then a whitebait farm rearing huge numbers of adults, in pond systems connected to a river system, might result in that river system attracting a disproportionate number of whitebait from the sea – basically attracting whitebait that would otherwise enter other rivers nearby. It is hard to imagine the local whitebaiters accepting that.

Whether whitebait home is really important for farming, because a whitebait farmer would not want to see the whitebait larvae he released to sea, then returning to freshwater as a result of his investment, spread all over the place and inaccessible to him for harvest. Random return has little appeal. Nor, perhaps, do kin recognition or pheromone guidance processes, as in theory anyone could release the right chemicals into the water and attract the fish liberated by someone else’s whitebait farm. Homing is clearly the whitebait farmers biological hope (and economic salvation) and there has been mention of it occurring. It has even been suggested as the “simplest explanation” for whitebait coming back into rivers from the sea. Hmmm ... not as I view it. Homing is behaviourally and physiologically complex, so much so that it was decades before homing in salmon was widely understood and accepted.

To date, no published evidence supports whitebait homing and some refutes it. Whitebait run into small streams along the coast in which barriers to migration prevent upstream movement, and in which there is no spawning habitat. Moreover, there are no adults there to provide attraction through kin recognition or pheromones. How could they be homing if there is no rearing in the stream they are entering?

There are examples of rivers/fishing seasons where the return bears no discernible relationship to availability of spawning habitat. Take the recent phenomenally productive season in South Canterbury rivers. Were whitebait returns really based on spawning production from these rivers? Whitebaiters fishing the Clarence and Waiau Rivers in North Canterbury report catching numerous banded kōkopu
whitebait, but adult banded kōkopu are not recorded from either river. So much for homing, there. And though it is known that certain features of river flows affect migrations – temperature is important, as is water turbidity, acidity (pH) and colour – there is not a hint that homing takes place. Furthermore, results of genetic studies have revealed no evidence that there is homing – geneticists write of “panmictic” populations around New Zealand, suggesting that there is wide mixing of stocks, not homing. I have spent a lot of time with this question, as it seems the Achilles heel of replication technology. Interestingly, the effort in developing this technology so far seems primarily to optimise other aspects of the process (as if homing is being assumed) and I am unaware that the homing question is being explicitly addressed. A recent newspaper headline reads: “Whitebait bred to run back home.” This, of course, is a double entendre – and could mean either they were being bred to develop the homing instinct, or in the hope that they will come home. The only accurate meaning of that headline is the second one, and if so, the assertion is false. The likelihood of whitebait homing evolving within human generation times is zero!

Determining whether the fish do home requires the application of sophisticated technology. Some might argue that the proof is in the number of fish returning, but that is not so. An increase in returns may be due to random changes in whitebait abundance from year to year, for which whitebait fisheries are notorious. Even if returns remain higher for several years, whether this is due to a period of naturally increasing returns, results from homing, or is due to some other factors like kin recognition or pheromones, is unknown. If the latter, the increase is being achieved basically by attracting whitebait from other rivers. The proof of homing comes not from fish coming back to the source river, but rather fish not entering other rivers – a fine distinction, perhaps, but a crucial one. Without firm evidence for homing, there is no future for replication technology. Because it is such a key element, it should be the first question addressed.

Finally, rearing broodstock through to maturity in semi-natural ponds/expanded natural habitats poses no major problems – increasing productivity is likely to be driven by a combination of increasing habitat area, better habitat suitability, and food availability, and minimising mortalities from disease and predators. All of these can be accomplished. Productivity can be enhanced by supplemental feeding. No doubt progress can be made with optimising food quality at the least cost, but this is a question of detail. Food costs could be a major issue.

Given all of the above, what are the prospects for whitebait farming in New Zealand and would I advise investment in a nascent industry? The overarching question is economics. Even with prices of whitebait approaching $100 a kilogram (and assuming aquaculture can produce fish that taste as good as the wild product), the question of economics has not been addressed. That question aside, the two major questions relate to:

1) Getting sufficient survival and growth of whitebait from larva to harvest at commercial scale in the sidestepping technology, and

2) Determining whether the fish returning from the sea to a whitebait farm do, as some hope, actually home back to that facility in the replication approach.

Both are major issues for which an affirmative answer is far from clear. So I am dubious about investment in whitebait farming, though I admire the courage of those prepared to do so. All too much past aquaculture investment in New Zealand has been based on high hopes and little knowledge. Many investors were “burnt” trying to establish ocean ranching of salmon (the salmon equivalent of whitebait replication technology). They set up farms where we told them failure was inevitable (Hokitika, Takaka, Catlins) and all failed. So, too, did farms even within the core of wild salmon distribution, as on the Hurunui, Rakaia, Rangitata, and Waitaki rivers, though return of fish was assured, economic success was elusive, despite technology for salmon ranching being well-developed and homing of the fish being proven. All of them failed commercially, though sea-cage and freshwater pond rearing of salmon has been a substantial success.
With whitebait farming, the technology is not developed and homing remains unproved. If whitebait farming has real prospects, I’ll be the first to congratulate whoever shows me I am wrong. I have nothing to gain from forecasting failure, though I do have concerns that the best advice is available to investors and that aquaculture investment is credible. Ocean ranchers of salmon got it wrong, but sea-cage salmon farmers got it right. It could be the same for whitebait farmers. But investment in whitebait farming has got to be high risk. Go into it with your eyes wide open.
1.12 How many species of brown trout?

Fish and Game 60, 2008

R M McDowall did a quick ‘tot up’ recently and found that a brown trout has appeared on the cover of this magazine 23 times in the past 30 issues, which led him to delve more deeply into the species.

If we look through back issues of Fish & Game New Zealand magazine, and especially if we lay them out on the floor, or on a large table, one of the things that will occur to the observant angler is how different the colouration of the various fish is, and editor Bob South, if he feels a bit defensive about repetitive use of brown trout on magazine covers, will probably say that publishing all these different looking brown trout can be justified by the need to show just how variable the colour pattern of this species is! Well, maybe! But that aside, the variation no doubt for some anglers raises questions about how many species are represented in our brown trout stocks.

Those with some knowledge of trout species and historical New Zealand angling literature will recall that well-published 1960s angler/author George Ferris, in one of his books, discusses two species, one of which he refers to as brown trout (Salmo fario) and the other as sea trout (Salmo trutta). Ferris wrote: “I am convinced that genetically we must accept the conclusion that ... we have a family of Brown Trout composed of cousins, half brothers, sisters in law, and they lead their separate lives, dress differently and act as different individuals ...” And he went on to point to a whole series of differences that he thought were important distinctions between the two ‘forms’. He summed this all up to by describing his “... sincere attempt by an observant angler to correct a disturbing angling trend.” And then he asked “scientific gentlemen for their pardon if (he) stray(ed) from the straight and narrow path of scientific nomenclature”. I, personally, have no problem granting Ferris such a posthumous pardon, though he was, in fact absolutely wrong.

If we go back even further in New Zealand angling history, we’ll find mention of a whole array of so-called different types of ‘brown trout’, with mention of ‘species’ like Loch Leven trout, Scotchburn trout, Lake Blagdon trout, Carpione trout, and others, all of which at times have had their own, distinct scientific names applied to them, names that don’t matter much in the context of this article. In addition, very few readers, if any, will know that recently a quite well-known Swiss fish biologist has resurrected a whole heap of additional scientific names, probably nearly 30, claiming validity for what seems to me to be a simply insane addition to the already complicated literature on the scientific names of these fishes. This quite mad fellow also extends his activities to a whole range of additional fish families, in the process turning our understanding of the freshwater fishes of Europe into what can only be called an unfathomable quagmire. I hope he never gets to work on New Zealand’s freshwater fish fauna!

In the early years of trout establishment, the acclimatisation societies quite often made reference to various of these so-called ‘species’, and it seems that they must have been investing quite some effort in keeping different stocks of trout apart, rearing them in separate ponds in their hatcheries, and only releasing certain types into different types of habitats – streams being different from lakes. The Otago Acclimatisation Society, for instance, referred to “Rhine trout”, arguing that “it would prove to be a very undesirable addition to our Salmonidae”, and at one stage Canterbury told of negotiating an exchange with another acclimatisation society of “salmon trout” for “Loch Leven trout”. There was from some a suggestion that the behaviours of the various types varied and that, for instance, the Loch Leven variety was to be preferred because it would “rise much more boldly to the fly than Brown Trout.” However, ichthyologists (fish biologists of a particular kind!) long ago clearly showed that these are all just the same species, known to science as “Salmo trutta”, a name that goes back to a Swede named Linnaeus, who found the so-called ‘binomial nomenclature’ that is used almost universally for the scientific names of animals and plants.
But all that said, if we were to lie together a whole range of brown trout from New Zealand rivers and lakes, just as I have suggested above for the cover photos of Fish & Game New Zealand over the past few years, we would certainly encounter what is a quite stunning array of colour patterns. At one extreme we have sea-run browns, which tend to be a dark silvery-black on the back, a silvery to a sort of ‘gun-metal’ grey on the sides, with dark spots on the back and upper sides, and the belly distinctly silvery. Nearest to those would be lake browns, which are often a dark grey-black on the back, fading somewhat to a silvery-olive on the upper sides, and a rather dull silvery-grey on the belly, the back and most of the sides, with prolific dark brown/black spots often surrounded by lighter halos. However, when we get to looking at river and stream-dwelling browns, we are faced with a plethora of colour patterns. Many are a warm golden-grey on the back, a little lighter olive/bronze on the sides and the belly distinctly brassy coloured, sometimes even with a reddish hue; much of the back and sides are covered with a profusion of dark grey-black spots, each surrounded by a distinct, paler grey halo. In some large riverine fish, there may be some bright reddish spots, usually towards the tail and at or below the lateral line, though far from always. But sometimes, especially in small and stunted small-stream fish, there are rather fewer, relatively larger dark spots along the mid-sides, as well as prominent bright crimson red spots, all of these spots again surrounded by very much paler, silvery-white halos. The darker the background colour on these fish, the more obvious is the pale halo around the spots. Sometimes, small browns are very brightly coloured and, in fact, this led to people on the Falkland Islands referring to some of their small brown trout as ‘rainbow trout’. There are no true rainbow trout in Falkland’s streams and, when I heard people there refer to ‘rainbows’, it rather had me foxed, until I saw some of their small, brightly coloured brown trout and it then made a little sense.

So, given all this colour variation – and setting aside the rather insane views of the Swiss biologist I refer to above – how many species are involved in our ‘brown trout’ stocks? But before we head down that debate, it is important to realise that even in individual trout, the colour pattern may vary during its life, with colours tending to become more intense and striking when fish move from the sea, or lakes, into rivers, and also when they mature towards spawning time in the autumn and winter. That, at least, is the basis for a considerable amount of the observed variation in both colour (hue) and colour pattern. Those who know my books will realise that I treat all of these colour variants just as brown trout. So what is actually going on here and how can we know that there is just the one species present in our rivers and lakes? If we go back a bit in history, we will find that the first brown trout brought here in 1867 came from Tasmania – based originally on some fish that had been introduced there from Britain a few years earlier in 1864. As far as I know, these original fish came from stocks that were thought to be river-resident browns in England. But, it seems that no sooner had they become established here than they began to go to sea, so some of these ostensibly resident ‘brown trout’ turned out to be ‘sea trout’ from the same batch of fish. The same thing happened at the Falklands. A stock of ostensibly riverine fish included some migratory sea trout. And, in fact, this is routine for brown trout. It seems that all stocks of riverine brown trout include some individuals that are anadromous, or sea migratory, and so are ‘sea trout’. They don’t have to go to sea and it probably doesn’t matter if they can’t, but, if they can, they will. It is not a life history imperative. Or, if we look at the reverse, it seems that all stocks of sea trout include some individuals that are non-anadromous, that don’t bother to go to sea, but which stay all of their lives in freshwater. Most often these resident fish are males and this has an interesting adaptive explanation. It is more important for the females to go to sea, as this enables them to grow much bigger, and so to produce a larger number of eggs, and so to increase the number of progeny that they produce. Size isn’t quite as important for males, though it does have some implications related to competition for spawning sites and spawning females, so being too small sometimes matters.

All that aside, along with the huge variation in brown trout colouration that I discuss above, there is parallel variation in their migratory behaviour. It goes even further than variations in behaviour among the various individuals in a population. In addition, some individual fish may change their behaviour from one year to another. Thus, some sea-run browns seem to come back into freshwater and migrate upstream into the spawning streams, spawn, and then stay there. But others of them, after spawning,
will go back downstream and return to sea to regain condition. I’m not sure how this variation in migratory behaviour through the life of an individual fish affects its colouration. That aside, when looking at the brown trout, we are looking at a species with immensely-varied characters, both visually and behaviourally. I reckon that if I could assemble a large enough collection of photos of brown trout, I could place them in a broad continuum of colour patterns and that the supposed differences between various forms would largely disappear altogether in a mass of variability.

There isn’t much detailed information on the various life-history characteristics of brown trout in New Zealand, but it seems to me that anadromous, sea-migratory brown trout are more prevalent in southern New Zealand, probably owing to trout preferences for cooler water. Quite probably, northern New Zealand streams, especially those at lower elevations, and also our coastal seas, are too warm for brown trout in summer and so the fish tend to retreat into the headwaters over the summer, especially, to find cooler waters. This raises some interesting questions relating to the implications of climate change for our trout stocks. My hunch is that as global temperatures continue to rise, the abundance/success of trout in New Zealand’s freshwaters will decline, especially at northern latitudes, and also the abundance of sea-migratory browns will retreat more and more into the cooler, southern waters.

In terms of our history of brown trout, the habit of going to sea was certainly very important to the early spread of the species around the country. The distribution of brown trout is immensely greater than that of rainbows and I have no doubt that this is due to the fact that browns go to sea whereas rainbows don’t. I know of no certain instance of rainbows being anadromous here and it is quite certain that we don’t have regularly anadromous rainbow, or steelhead, populations here. As a result, rainbows tend to have rather narrower distributions, though there may well be some other behavioural traits that also affect the distribution of rainbows. But during the early years of trout establishment, anadromous brown trout went to sea and spread very widely, invading lots of river systems into which there had been no releases from hatcheries by the early acclimatisation societies. And so, brown trout rapidly spread around the country, just fine thanks, with no help needed. Some anglers will realise that, like salmon, brown trout routinely home back to the stream in which they were born and, if this is so, will ask how, then, did browns spread into other catchments? Well, they don’t home perfectly and all populations have some fish that stray, get lost, and just a small percentage straying was, I think, enough to assist brown trout in spreading around our coasts and entering virgin river systems. The few ‘wanderers’, or ‘strays’, have been immensely important in the historical spread of the species. Sometimes they have strayed huge distances, such as a fish tagged in the Rakaia River, which was later recaptured in Southland in the Mataura, I think, but I’m uncertain.

It’s interesting that there seem to be no brown trout in the streams of either Stewart Island, or the Chathams. This absence is almost certainly evidence that the waters on these islands are unsuitable for brown trout. If there were suitable habitats for brown trout there, they would have become established there, naturally. Certainly, there are plenty of brown trout in the rivers of Southland and I’d guess plenty in coastal seas in the area, and spreading across Foveaux Strait into Stewart Island rivers would be no bother to brown trout. But, they don’t seem to have found a congenial place to live in these Stewart Island rivers. It could have something to do with the intense brown-staining of the Stewart Island streams and much the same may be true of the Chathams, though they are, of course, rather further from the New Zealand mainland.

In Britain, there are actually three ‘varieties’ of brown trout, known variously as brown trout and sea trout, as I’ve just been discussing, and another known as ‘slob’ trout. Slobs are actually brown trout that hang around river estuaries, which never go long distances to sea, but do move into the marine/freshwater interface in river estuaries. Why they are called ‘slobs’ I have not the faintest idea.

Forgive me, if having made all that ‘clear’, I now introduce some evidence that is contrary to all of the above. Fortunately, none of this, it seems, has implications for our brown trout/sea trout stocks. There are several lakes in Britain, especially in Ireland, where, it seems, there happen to be more than just one ‘species’ of brown trout. Evidence being gathered by geneticists, using comparisons of their DNA, is showing that there are sometimes multiple stocks of brown trout in the same lake, each with its own
behaviours and diets, and which somehow seem to be remaining reproductively isolated from each other – the different strains remain separate and there doesn't seem to be any hybridisation going on between the various stocks. This complexity probably has derived from multiple, sequential invasions of these lakes over many thousands of years, where the original, resident stock has been isolated in the lake for several thousand years and has diverged from the ancestral stock. Then, some changing river connections, or some chance event, has seen another invasion of brown trout into the lake and somehow the stocks have been able to remain distinct. This poses all kinds of problems for fish taxonomists that have yet to be grappled with, but it does show how tremendously plastic and variable some salmonid fishes are. There's no easy solution and even my loony Swiss colleague has no answer for resolving this conundrum. In effect, we are dealing with the ongoing processes of evolutionary divergence and, in this instance, there seems no easy solution.

So, next time you catch a brown trout, look carefully at its colouration especially, or, better than that, get out some of your photos of prized brown trout that you've caught over the years and get some hint of just how very variable this species is. I suppose that only adds to the interest in fishing for this beast!
R M McDowall looks at the genetic makeup of our introduced rainbow trout stocks.

It is a moot point as to whether the rainbow trout or the brown trout is the most important trout species in New Zealand. I guess in a way it doesn’t matter anyway. Both are highly valued by anglers, but browns are more widespread and much more challenging to catch, whereas rainbows, though less widespread, fight better and, being easier to catch, are more compelling for the novice angler. This makes rainbows important for luring new anglers into the sport.

I wrote in Issue 60 about how many different morphs there are under the name brown trout, which relate to differences in life history strategy, size and age, and habitat type, and particularly whether we are looking at migratory sea-trout, river stocks, or lake populations. Well, in a different sort of way, under the rainbow you can get just about as much variation, for much the same reasons.

I recall once catching a rainbow from the upper Rakaia and noticing the ‘cutthroat’ markings under the head, and thinking: Are there cutthroat genes somewhere in our rainbow stocks? And that isn’t an entirely silly question, as in the 1870s cutthroat were brought here – or at least someone tried. No one has really seriously suggested that New Zealand rivers have populations of this species, a fish now known in North America as *Oncorynchus clarkii*. However, a quite eminent Canadian fisheries biologist, who had spent most of his life working with western North American salmonids and should have known better, did identify some New Zealand cutthroat. This created quite a flurry of interest and action here for a while, though studies of the DNA of New Zealand trout stocks provided no evidence for any cutthroat genes in our populations. We have to be a bit careful totally writing off this prospect as the number of fish tested was quite small and there just could be some cutthroat genes somewhere, but I rather doubt it.

Certainly you can catch rainbows here with cutthroat markings under the head – though in my experience they tend to be yellowish, rather than red, as they would be in certified cutthroats.

But, returning to my original theme: What variants are there under the name rainbow, what do they mean, and what are the implications for us here where rainbows are, of course, introduced? Occasionally, you do strike some ignoramus, who thinks rainbows are native. I heard recently of a newspaper reporter getting quite excited about some river management scheme that she thought was endangering our ‘native’ trout stocks (and she wasn’t referring to kôkopu, or so-called ‘Māori trout’, either!).

Our rainbows originally come from North America where the species belongs, but they aren’t the so-called Gerrard rainbow stock from Canada as was once suggested, nor do they seem to have come from the Russian River, or the McCloud River in California, as others have suggested. However, the taxonomic situation of these fishes in North America is really chaotic. Under the name *Oncorhynchus mykiss*, or what was for a century or more here, *Salmo gairdnerii*, there are three morphs: steelhead, rainbow trout, and redband trout. I think (I’m not sure because it is so complex) these three forms comprise:

- the steelhead, which is a type of rainbow that is anadromous, and migrates to and from the sea, and these are the really big trout that North Americans fish for in the lower reaches of western rivers
- the rainbow trout, which is probably a non-anadromous type of fish that doesn’t go to sea, and usually doesn’t grow as big, though it may sometimes do so in really beneficial food environments, and it is probably this fish that is found in many of the coastal drainages and lakes of North America
- the redband, which is a usually smaller form that is found more often (though it seems not always) in inland drainages. I suspect that any fish in an inland drainage is probably a redband, though a redband does not necessarily occur only in inland drainages, if that makes sense. There are, I think, some stocks of redbands that are anadromous, too, and knowing that doesn’t help.
I won’t go into the differences in colouration and form between these various types as it is so complex and also because an individual fish varies so much across different ages, life stages, and habitat types. But I will make one comment. When I was a lad, we sometimes used to catch small, bright, silvery rainbow trout in Lake Taupo that had deep blue backs, rather than the more usual greenish backs of most rainbows there, and sometimes they were referred to as steelhead. Well, they aren’t, but are just a semi-distinct colour morph of the ordinary rainbows from the lake, and their blue backs may just relate to their age and possibly the fact that they live in the deeper waters of the lake. But that’s sheer guesswork on my part.

I suspect that my listing above of three different forms of *Oncorhynchus mykiss* is a substantial simplification and, if you go to Bob Behnke’s books on North American trouts, you’ll find it all much more complex and less explicit and, to be frank, American fisheries biologists have not settled on the final and definitive word on this problem – nor will they ever, in my view. Which reminds me…if you want a real visual treat, have a look at Behnke’s Trout and salmon of North America, published in 2002 by Chanticleer Press, where he discusses the almost endless varieties of salmons and trouts. As well, you can get a look at the simply superb drawings of all these fish by artist Joseph Tomellori, and marvel at what he achieves with coloured pencils (you may not believe me, but that’s what the book says, they’re drawn with coloured pencils).

Getting back to my statement that we will probably never really understand what’s going on, you’re entitled to ask why I make that rather categorical statement. Well, it’s because we are dealing with a highly dynamic and rapidly evolving evolutionary scenario with various populations and stocks being at different stages of the divergence process. It has not been helped by North American fisheries biologists shifting fish around all over the place, thinking that they know better than nature does, about which fish should be where and, as a result, there are all sorts of hybrid stocks. Sometimes the ancestry of the hatchery stocks is not properly understood and that’s something about which Bob Behnke has some distinctly ‘acid’ words to say. Some highly divergent populations of this ‘species complex’ in western North America have essentially been ‘hybridised out of existence’ as a result of rather careless hatchery releases. Other types are now extinct because of habitat modification and, in all probability, we will probably never know exactly what has happened.

So, given all of that, what do we have in our lakes and rivers, and is anything ‘interesting’ going on here? We need at the outset to recognise that virtually all of our rainbows derive from a stock that was once in Sonoma Creek, which flows into San Francisco Harbour, in California. These came to New Zealand in the late 1880s, just a single consignment, and in all probability all of our rainbows are derived from that stock and introduction. There could have been some earlier introductions, though this remains uncertain at best. Also, the Auckland Acclimatisation Society seems to have imported some additional fish in the late 1920s or early 1930s, but the fate of these fish remains unknown. The originally introduced Sonoma Creek fish are believed to have been anadromous rainbows, or the steelhead variety. (I explore this in more detail in my book ‘Gamekeepers for the Nation’, if you’re interested).

Interestingly, Australian stocks of rainbows are, I think, derived from fish originally brought here – the reverse of our brown trout that came here via Tasmania.

I commented in my Issue 60 brown trout article (How Many Species of Brown Trout?) that rainbows have a rather narrower range in New Zealand than brown trout, which prompts the question: “Why?” But before we can address that question, we need to have a look at some of the details of their New Zealand range. Rainbows are the predominant species in the big central North Island lakes and are widespread in South Island lakes as well. Otherwise, their range is quite peculiar. They seem to do best in the upper reaches of big rivers and to some extent spread downstream a bit. The best known riverine populations are probably those in the upper Rangitikei River, but our rainbows are found well inland in lots of the bigger rivers. Here and there, we can find thriving populations at lower elevations and the one in the Pelorus River, which flows into Pelorus Sound in Marlborough, comes to mind. In a way, the most intriguing feature is that we don’t much get rainbows in the lower reaches of these rivers. Why, for instance, none in the lower Rangitikei, with the thriving upstream populations, and those of most
interest to anglers. We really don’t know what’s going on. It could be partly that the lower reaches of our rivers are too warm for rainbows in the summer, except that there are brown trout there and they are probably more sensitive to elevated temperatures than rainbows. Also, I can’t believe that the lower reaches of rivers, like the Waiau in Southland, are too warm, even in mid-summer, and there are plenty of rainbows upstream in the Mararoa.

Back in the 1980s, former Conservator of Wildlife in the central North Island, Pat Burstall, had a mania for getting anadromous rainbows established here and figured he might be able to force a population to become anadromous by liberating them into a river system with no associated lake. There was a series of hatchery releases in a Bay of Plenty river – the Motu, I think, but I’m unsure about that. But it was a total failure. The fish that Burstall liberated might have gone to sea, but if they did, they never came back. It’s probably easy enough to get the first part of the equation correct and get them to migrate to sea, but getting them to return is another question. Just why Burstall chose the Motu (if I am right), or any other Bay of Plenty river for that matter, is uncertain, except, perhaps, that he had a house in the area. And why they might be expected to behave any differently from the long-established population in the Rangitikei or elsewhere also rather eludes me. You’ll probably have gathered from these comments that Burstall’s experiment was a failure, even to the point that, as far as I know, the rainbows never even established a river-limited population in whichever river the fish were liberated in.

It’s fascinating to look at human attempts to get anadromous fish established, and how people think they know better than ‘nature’. This is epitomised, I suspect, by the huge amounts of money thrown at trying to get Chinook salmon established in the Takaka River in an area (Golden Bay) where salmon did not occur. Hundreds of thousands of salmon smolts were sent to sea and, as far as I know, not a single one returned from sea to the source hatchery. I recall once getting a phone call from a relative of one of the people who bank-rolled that fiasco, weeping over the phone at his inheritance being poured into the Takaka River and wandering off downstream and to sea, and pleading was there anything we could do to increases the likelihood of success? I told him to “talk to nature”, which would answer his question with little uncertainty. Imagine salmon smolts pouring down in their thousands into the limpid warm, shallow seas of Golden Bay! The chances of getting them to return to that area in the late summer have to be zilch. And we could ask some of the same questions about salmon farms at Owaka in the Catlins district, or another on the Hokitika River. In those two cases, occasional fish did come back, but not enough, and only as long as releases continued. The Otago Acclimatisation Society thought it could teach “nature” a few things by making Chinook liberations in the Taieri, but it was the same old story – occasional fish came back, and people were beginning to get excited about ‘hopeful’ signs of spawning, but I’ve not heard anyone talk about the salmon run in the Taieri for a good number of years now. I argued that, if conditions in the Taieri suited salmon, they would be there naturally, based on straying from other rivers in the eastern South Island. And so we can say much the same for anadromous rainbow trout: we’d have them, if conditions were appropriate. We don’t and they aren’t, as far as I can tell.

The failure of rainbows to spread downstream in our rivers is more of a conundrum and I don’t have an answer. Occasionally, rainbows are caught in the lower reaches of our rivers. I heard of an angler catching one, I think, in the Waimakariri a good few years ago. And there has been occasional talk of a few in a Hawke’s Bay river – the lower Ngauroro, if I remember correctly. In a way, these very occasional exceptions just emphasise what seems to be the rule: anadromous rainbows are a failure here. That’s too bad in a way, as they are a superb angling species and, moreover, they would probably cause less biodiversity havoc than is caused by the populations in the big central North Island lakes (or they’d do it at sea where we can’t notice it – out of sight, out of mind!).

Just what is happening is unclear. I suspect perhaps the following. There are probably two potential migratory strategies in our populations – or at least there were two strategies when rainbows were first introduced more than a century ago – and it is much the same dichotomy as I discussed for brown trout in Issue 60. The founder populations probably had two behavioural tendencies: some tended to migrate downstream and go to sea and others tended to ‘stay put’ (what evolutionary biologists call “philopatry”
– a fancy Greek word for “love of home”). These two migratory behaviours probably have inherited, genetic origins. If, as seems to be the case, the fish that were migrants would have gone to sea and never found their way back into our rivers. As a result, there would have been very strong genetic selection against those that were migrants. Now, if that is so, then the genes promoting migration probably disappeared very rapidly from the populations and, with that, the tendency to migrate would have disappeared (largely, but not entirely, I suspect as there would have been some reversion going on all the time, as well). But this would have left the populations dominated by non-migrants and these are still numerically dominate in our riverine rainbow trout stocks.

You might wonder what would happen if we started to stock rivers without lakes with fish from Taupo, which are very clearly migrants. But that’s just what Pat Burstall did in the Bay of Plenty and, as we have seen, none ever came back. You could perhaps argue that he chose the wrong river. I think the choice of a river in one of the warmest parts of New Zealand was simply daft and, if I was going to experiment with what Burstall experimented with, I’d have chosen a cold southern river system. But then I wouldn’t have tried it at all.

We often skite that New Zealand is the only place in the world where there are acclimatised stocks of Chinook salmon, and this was once probably correct. However, from some observations in the past few years, it seems that there are anadromous populations of both Chinooks and rainbows in some rivers in Patagonian Argentina (about which NIWA’s Martin Unwin wrote in The Patagonian Connection in Issue 61). I recently had some correspondence with a Chilean biologist who argues that some of these salmonids have been anadromous for many years in the rivers of Patagonian Chile. I am a bit uncertain about the hard evidence for this, but regardless, it seems that some interesting things are happening in southern South America and the various salmonids introduced there (and, I might add, they have caused the same havoc among the native fish species there as they have in New Zealand). So, might we expect to see something similar to what has happened in relationship to anadromy in the Patagonian salmonids, and see some real steelhead in New Zealand rivers, too? It’s always possible, but I’d not be betting on it.
2 On the management of land and water

A raison d’être for the early acclimatisation societies was to establish hatcheries to stock rivers with juvenile trout and salmon. Bob backgrounds some of the research which showed that stocking was seldom needed, although this advice was destined to fall on deaf ears for many years. He also takes issue with those that claim that cormorants (shags) need to be controlled – while shags are obvious predators on fish, and hence an easy target for disgruntled anglers, Bob points out that how surplus juvenile fish die is not an issue, and, ironically, the ‘good old days’ of fishing occurred when shags were in abundance anyway.

However, he discusses the continued spread of pest fish with some passion, as he considered this to be a form of ecological vandalism. His essay on possums and the impacts that an invasive species can have on a poorly adapted flora highlights the unwise introduction of new species without proper prior investigations of the likely impacts. Likewise, he discusses the earlier proposals to introduce the North American largemouth bass into New Zealand, and concludes that this too would have had dire ecological consequences. Incidentally, Bob was instrumental in providing robust scientific reasons for not allowing the introduction of bass to take place in the 1970s, advice that was heeded but was contrary to that provided by his then boss.

In an essay on wetlands, Bob expresses real concern about the extensive loss of wetlands nationwide that has happened during European settlement of New Zealand and comments forcibly on the need to improve environmental monitoring to avoid the repetition of such practices. The essay on the Taupo trout fishery is somewhat provocative, and grew out of a public meeting in Turangi in 2008, where Bob spoke. Irrespective of the causes of the decline of this magnificent fishery, Bob felt it personally as fishing at the Tongariro and Lake Taupo were some of his earliest memories, and defining moments in his choice of career.
2.1 Once were wetlands

*Fish and Game* 20, 1998

Early one summer morning in the 1960s, I caught the ‘redeye’ - the first plane out of Christchurch for Wellington at 7am, a flight that is commonly patronised by public servants, businessmen and politicians heading to the capital for a day’s work.

I found myself in the front row (it was in the days before business class), and was sitting beside Derek Quigley, at the time a Minister in Muldoon’s National Party Cabinet. As we took off into a gentle southerly, banked to the west, and turned to head up towards the Kaikoura coast, the chequerboard of farmland and crops lay beneath us, the grassland parched yellow from the northwesterly winds that billow across the plains. Having dropped all their rainfall in the mountains, the winds are warm, and suck all the moisture from the pasture. Irrigation could be the salvation of that farmland, and would certainly greatly increase its productivity. Quigley murmured, as if to no one in particular, though quite audibly: “We’ve got to do something about how the water is allocated for irrigation of that farmland”. He would not have known who I was, and that I was involved with a team of fisheries scientists and technicians from the Freshwater Fisheries Centre of the then Ministry of Agriculture and Fisheries, that was flat out trying to get to grips with the fisheries values in the Rakaia River, the likely source of any water to irrigate the land we were flying over.

There was at that time a looming major battle for water from the Rakaia to irrigate more than 150,000 hectares of land between the Rakaia and Waimakariri. Mostly, farmers wanted to take the water from the river to make farm production more reliable. Some, however, wanted it primarily to improve the capital value of their properties and make it a better selling proposition. In fact, it has been said that some properties were actually bought by business consortiums simply with the aim of raking off the capital grain that would accrue to land as soon as it obtained irrigation. Of course, in those days, irrigation was heavily subsidised by the taxpayer, so these “businessmen farmers” would be getting capital gain at public expense and passing on the increased capital value as debt or overheads to those who layer purchased the land.

If it were not for the excessive greed of some irrigators and their Ministry of Works and Development advisors - who planned to reduce the minimum flow of the Rakaia to 50 cubic metres a second (roughly a quarter of its median flow) - they might have achieved their end of using Rakaia water for irrigation. As it happened, angler groups quickly became alarmed at the prospect of the Rakaia being treated in this way. An application was lodged for a National Water Conservation Order by the North Canterbury and Ashburton Acclimatisation Societies and the National Council of Acclimatisation Societies, supported by the technical input on fisheries values in the Rakaia from the MAF Freshwater Fisheries Centre in Christchurch. It was eventually approved (after a local hearing by the North Canterbury Regional Water Board and Catchment Board, followed by appeals in the then Supreme Court and Appeal Court) and irrigation aspirations were halted, at least for a decade or more.

That summer morning Derek Quigley and I were very clearly looking down from the plane at a highly modified landscape, compared with its former natural condition before human settlement. Extensive areas of the plains were probably once covered by forest, but burning by Māori during over a thousand years of pre-European settlement had reduced much of the vegetation cover to rough scrub and tussock. Noted early settler in the upper Rangitata at Mesopotamia Station, Samuel Butler, described the scene in 1861 as he rode his horse across the plains from Christchurch to the Rangitata, as follows:

“Before one and behind one, and on either hand, waves the yellow tussock upon the stony plain, interminably monotonous… the river bed … in the process of gradually being covered with cabbage-trees, flax, tussock, Irishman and other plants. Eighteen weary monotonous miles over the same plains, covered with the same tussock grass, and dotted with the same cabbage trees.”

Nothing is like that any more, and instead there is an extensive network of roads, neat paddocks of grazed pasture or monocultural crops, usually defined by fences, occasionally by gorse hedgerows.
Sometimes they are surrounded by rows of pines or macrocarpas to stem the northwesterlies and protect the precious soil and its valuable moisture, and to provide winter shelter for sheep when the occasional winter snows arrive.

But even more dramatic has been the change to the coastal strip of land, the area between about the main South Island railway line and the sea. So dramatic has been the change that its original state is almost unimaginable to anyone passing through the area. There are few, if any, still alive who would remember much of its original state. But there are lots of clues that help us to obtain a picture of what it was like.

Early settler Thomas Tancred, as he strode over the Bridle Track from Lyttelton, paused to take in the view across the Plains from the Port Hills. From this elevated viewpoint, he described how he saw ... “a tract of rich alluvial soils, interspersed with swamps where the native flax, grass, a palm-like shrub, and in the more decided bogs a kind of bulrush flourish. A tract of this swampy land runs along the base of the peninsula hills ... This kind of country - viz. swampy intermixed with drier tracts - extends round the base of the peninsula hills to the west and south as far as Lake Ellesmere, and also parallel with the coast for about twenty-five miles northward from the peninsula hills, having a width of from eight to ten miles. The same kind of country prevails to the south of the peninsula nearly to the boundary of the [Canterbury] province”.

This went, presumably, as far south as Timaru.

This perspective was also described by James Stack:
“...The plain below us looked like a great flax swamp and stretched away south as far as the eye could see.”

Of course, just to the south of the Peninsula was (and is) Lake Ellesmere, which Māori now accurately complain is less than half its former size - the shores of the lake once extended inland as far as Lincoln township and its university, now several kilometres from the lake shore. Māori travellers, who wanted to head south from around Christchurch, chose to walk along Kaitorete Spit (which separates Lake Ellesmere from the sea, to the southeast), rather than struggle through the wetlands that extended inland from the lake and made southwards passage difficult. And there used to be an extensive wetland at the northern end of the lake that extended right to the foot of the Port Hills, making travel along the flats from Christchurch to Little River difficult - a wetland that was soon drained, partly to allow construction of a railway to carry timber from Little River and the Peninsula to Christchurch.

There are well-known early descriptions of Christchurch city itself, with comment about extensive areas of wetland, and of the twin rivers that flow through it - the Avon and Heathcote - winding deep and mysterious amongst flax and raupo.

Less well known are accounts of early settlement of the farmland along the Canterbury Plains to the south of Christchurch, which also reveal much of what the countryside was once like; early descriptions of the activities of colonial farmers that typically speak with eloquence and warm praise about their skill and energy as land developers.

E.C. Studholme, whose forbears were the original settlers of the land around Waimate, included in the history he compiled of his family and the early Waimate area, a chapter with the highly prosaic title “Draining”. This begins:
“When the Studholme brothers took up the Waimate run, it was anything but an attractive proposition. Many people thought the brothers mad, and said so; for although the inland portion of their country was comparatively dry and open, and provided good grazing for stock as soon as patches bad been burnt, the large coastal area was very wet and swampy, and quite unfit for stock.”

The land was intersected by winding, boggy creeks, was very wet, and was covered with a dense growth of rushes, sedges, and flax, a great belt of which stretched from the Waimate Gorge to the sea. Much if it was actual swamp. The main swamp extended from what is now Willowbridge as far north as the Makikih river, comprising thousands of acres of quaking bog, impassable except in some places “where a man could jump from one giant niggerhead to another”. Studholme went on to describe the
problems involved in draining this country - problems that clearly could be overcome, since virtually none of the swamp is left. The coastal country was regarded as practically useless until it had been drained, which was a tremendously costly and difficult undertaking. The main springs could generally be located because of the extra growth of flax and sedges that surrounded them. Deep, straight drain cuts were dug to connect them with the chief outflow to the sea. Side drains leading into the deep ones were then dug and joined up to the smaller springs.

And Studholme wrote of huge totara logs that made this process greatly more difficult, haunting symbols of the former lowland forest that once clothed the plains, forest that persists only as pathetic remnants such as Peel Forest and Riccarton Bush, After the land had been drained and stocked some of it settled down "several feet", and this left little or no fall to carry the water away, so that some of the drains had to be regraded. It was found that the best land was where the flax and sedges had grown the tallest. Although some of it became very valuable, in the early days it was regarded as "a sink for money" because of the enormous sums required to bring it into production. Some of the land cost more to drain that it was worth.

A little north of Studholme’s Waimate was John Grigg’s Longbeach - originally a pastoral run of 32,000 acres that extended along the central Canterbury coastline from the Ashburton River to south of the Hinds River, but now subdivided into dozens of small farms. Looking at this landscape today, it is impossible to even begin to imagine what it was once like. Arriving in Canterbury in the late 1850s, Grigg found that the "fattest cattle" came from countryside “between the mouths of the Ashburton and Rangitata Rivers", though he was told that “most of the country there is bog”. Not one to be dissuaded by a challenge, Grigg set to developing this land with astounding energy, and in only 15 years had converted most of his land from what has variously been described as “wasteland”, a “dismal swamp”, and an “impenetrable bog” into highly productive farmland, once described as the “finest farm in the world”. It is said when Grigg first visited the area, he went down onto the sea beach, which is backed by low cliffs above which the farm land now sits. He could see water seeping through the cliff gravels. This would have been the water that had made the land above into the “impenetrable bog”. He could see that cutting channels down through the edges of the cliff would allow this water to drain away, and he was soon at work.

In geological/geomorphological terms, what was probably happening along the coastline is as follows: The whole of the South Island is very slowly tilting, with the west coast sinking (which is why there are drowned valleys in Fiordland), and the east coast rising. At the same time as the east coast is rising, erosion of gravels from the Southern Alps is building up the plains. The big rivers, such as the Rakaia and Rangitata, that drain the Alps bring thousands of tonnes of gravel down, which builds up the plains, and then they cut down through the gravel to reach the sea. In pre-European times, between the big river channels, the water lay over the land, unable to escape to sea as the east coast slowly rose, and became trapped along the coast in the huge swamps that Studholme, Grigg, and others developed into pasture and cropping land.

Originally, the Hinds River drained from the inland hill country until it reached about the position of the present main trunk South Island railway. There, it just disappeared into this vast swampland, spreading over thousands of acres. Other smaller rivers between the Ashburton and the Hinds Rivers did the same. Then, several miles further east, a channel emerged from the swamp as the Hinds River and drained to the sea. In between were about 8km of swamp with no explicit river channel through it. Not daunted by a task that would have dissuaded most people, Grigg decided to drain this vast area, and decided where a channel might be carved through the swamp to allow the flows to pass straight through. So, the present Hinds River, from a little east of the present railway line to quite close to the sea, is actually an artificially constructed river, and historically there was no officially recognised river channel since Grigg had carved it out himself from the swampland. Who today would guess? That done, Grigg and his team of workers, constructed a complex of additional open drains that sucked the water from the swamp to the sea, making the rich, peaty soils of the former swamplands available to grow grass and diverse
crops. Moreover, he built a brick factory, in which his staff made field-drain tiles. His workmen reportedly fired and then laid about a million of these piles along nearly 250km of drains across the land, including 65km in a single year. Grigg’s biographer wrote of intense activity at Longbeach, with gangs of men in Grigg’s employment digging their way through the swampy peats and clays “to free the squelching soil from water”, following by burning, and then sewing with pasture grasses, the men “avoiding the bog holes which would still suck a man waist deep - and more”. In about 40 years he converted what commentators had described as “impenetrable bog” into 32,000 acres of pasture and cropland.

All of this, today, is totally unimaginable to someone driving down the main highway through the area. Now, there is scarcely a fragment left of this once huge swampland. The landscape that Grigg purchased as “impenetrable bog” is now a neat patchwork of dozens of farms, grazing sheep and cattle, and raising crops of wheat and barley. Agriculturists and economists exult in the fantastic job that Grigg and his workers accomplished. For biologists and conservationists, it is a somewhat different story.

Everywhere, irrigators are pumping water out of the ground, or from the network of drains across the plains to make it possible for the once sodden, but now parched, landscape to remain productive and profitable. Stand on the stopbank that now constrains the little Hinds River to a narrow flood channel, and on one side can be seen the flows of the river reduced to little more than a trickle, while on the other masses of irrigators are slowly rotating and restoring to the former wetland enough water to make grass or wheat grow.

Of course what I have written of here is not peculiar to Canterbury, but has happened all over New Zealand. At a national level we have probably lost more than 90% of our original wetlands, reaching the point that wetlands need to be regarded as amongst the most endangered natural habitat types we have.

Much more often written about, and therefore better known, has been the loss of wetlands in the Waikato, the lower Manawatu, parts of Northland, the Hauraki Plains, and the West Coast. Canterbury rarely gets a mention, probably because it seldom occurs to anyone that such extensive areas of this province, too, once were wetlands.

Wetland drainage was an abiding passion for the early settlers from the beginning of colonisation in many parts of New Zealand. This passion probably had its origins in the attitudes of our British ancestors. When James Cook was travelling the seas around New Zealand in the late 1760s, he was accompanied by the most notable British scientist of the 18th century, Joseph Banks. Banks and his family had been swamp drainers in their homeland, developing farmland from the bogs of the English fens and so, not surprisingly, when he saw extensive wetlands in New Zealand he commented that they could be drained and developed into rich and productive farmland. He was, of course, right. The early settlers brought these attitudes with them to New Zealand and swamp drainage has occurred all over the country. Christchurch, the main city of Christchurch, was even built on a swamp - the swampland that Thomas Tancred and James Stack had seen from the Port Hills. With the logic and benefit of hindsight, we might now well ask why they settled there at all. But they did, and to live there comfortably and safely, this required that the swamps be drained, and the Canterbury settlers were no different from others elsewhere. The earliest settlers really feared the dangers of “swamp fever” (whatever that actually was), and this alone was enough to provoke them to drain the swamps amongst which the embryonic town grew.

What are the biological implications of all these changes? As some laud the energy and commitment of the settlers in converting apparent swamp wastelands into productive farmland, we tend to forget that this cannot have happened without major effects on fauna and flora - birds, fishes, insects, and, of course, the rich assemblage of swampland plants originally to be found there. Still-common birds, like pukeko and various ducks, must have suffered vast, now almost incomprehensible, reductions in numbers.

And, of course, the fish faunas of these wetlands have largely disappeared. Studholme wrote of what he called “kokopara”, or giant kōkopu (Galaxias argenteus) formerly abundant in the wetlands, and found
that they soon had become rare to extinct. He blamed the introduction of trout, and in part he was probably right, though this would have been a significant impact only after the habitat had been so profoundly modified that it was by then suitable for trout, but marginal for kōkopu anyway. Apart from a landlocked population of giant kōkopu in an isolated coastal river ox-bow near Temuka, I know of only one reliable record of this species from the whole of Canterbury during the past 50 years.

Banded kōkopu (*Galaxias fasciatus*) were undoubtedly widely present in streams of the plains, too, but now seem restricted to a few small, isolated, precariously-protected pockets on the plains, though they remain widespread in bush-protected tributaries on Banks Peninsula. Both kōkopu are whitebait species, so it is perhaps little wonder that there are common complaints that the productivity of the whitebait fishery has declined.

The more coastal, low elevation wetlands were certainly the haunts of inanga (*Galaxias maculatus*), probably in vast numbers. This species is the principal component in the whitebait fishery, and though inanga remain abundant in the lower reaches of the coastal rivers of Canterbury, the numbers of this species will undoubtedly be only a fraction of what they once were, this decline being the chief reason for the fishery's decline.

The Canterbury mudfish (*Neochanna burrowsius*) is one of New Zealand's most seriously threatened freshwater fish species. It distinctly favours wetlands, and it is impossible now to imagine how abundant this fish once was in the huge areas of wetland that have now disappeared from the Canterbury Plains. It was always restricted to Canterbury - from about Oxford in the north to the north banks of the Waitaki River in the south. Its latitudinal range is still about the same as it originally was, but it is now restricted to pathetic residual fragments of wetland that survive, scattered across the often dry and parched Canterbury Plains that Derek Quigley and I saw as we took off for Wellington that day many years ago. Some of the populations are in such small areas that their future must be limited another serious drought, or an increase in the intensity of land use and a decline in the level of the ground water tables, and these populations will disappear like so many before them already have. Again, the very extensive swamp-drainage programmes of Studholme, Grigg, and others in Canterbury must have caused major reduction in numbers of Canterbury mudfish. The habitat from which this species was first collected in the 1920s, a wetland near Oxford in North Canterbury, has disappeared and is now dry pasture with intermittent drains. Canterbury mudfish can no longer be found there.

It is not as if this species has difficult to find, or demanding habitat requirements. For instance, they are well-known to be able to aestivate - when free water disappears they become more or less torpid in remnant damp locations, such as beneath logs, or in holes in the mud, until rainfall restores water to their habitat. There is an area of water seepage at the Christchurch laboratories of the National Institute of Water and Atmospheric Research, right in the centre of the city and no more than a kilometre from Hagley Park. It is surrounded by concrete and asphalt paving on two sides, and is sited just behind the "dangerous chemical stores" on the site. In this tiny wetland fragment, no more than 10 square metres and often less when the weather has been dry for a long time, there has been a thriving Canterbury mudfish population for nearly two decades that resulted from former NIWA science technician Tony Eldon liberating a few there.

Early in the spring, each year, larvae of the species can be seen sculling around in the small area of open water, and not infrequently, we set traps in the water and easily catch a few mudfish for some purpose or other. So they are robust and vigorous fish, but they just cannot cope with terminal disappearance of the water and associated plants and food organisms on which they depend, and have become hugely reduced in number throughout their range.

Much has been written about the loss of wetlands from the Waikato and the impacts of this loss on the plant and animal communities there - and it has been massive. Somehow, this loss in the Waikato is more graphic and gets more attention, perhaps because some major wetland fragments, like the wonderful Whangamarino Swamp, remain there to remind us of what much more extensive areas of the Waikato were once like. In Canterbury, there is virtually nothing left to remind us, and as time passes and
memories grow thin, we forget altogether and really have no idea of what has been lost.

The ultimate irony is that the formerly extensive wetlands of Canterbury are now highly productive farmland whose full potential can be realised only by irrigation i.e. by returning to the surface of the land much of the water that was so aggressively removed by pioneers such as Studholme and Grigg. The land now becomes so dry that growth ceases and productivity declines, stock suffer malnutrition, and crops fail. Farmers grumble and seek relief from government. And so, one generation of farmers having effectively eliminated the wetlands and the plants and animals that lived there, another generation (and often the descendants of the original farmer s), now draw water from the rivers to return it to the land to restore soil moisture and promote growth, thereby threatening the fish and other fauna that live in the rivers. Already, water abstraction from some of the smaller rivers results in their mouths becoming blocked by the coastal drift of beach gravels for extensive periods of the year. This prevents immigration and emigration of all sorts of fish species that live in the rivers and which must spend part of their lives at sea:

Not just whitebait (various species of *Galaxias* discussed earlier), but also:

- *llamprey* (*Geotria australis*), once taken from coastal rivers by local Māori
- *eels* (*Anguilla* species), that support important fisheries and are of very great traditional importance to the hapu of Ngai Tahu Māori along the Canterbury coastline
- Stokell’s smelt (*Stokellia anisodon*) which pour into coastal rivers in their millions during the spring, which were once taken and dried by Canterbury Māori and which form an important food for estuarine brown trout (Salmo trutta)
- *torrentfish* (*Cheimarrichthys fosteri*), bluegilled bullies (*Gobiomorphus hubbsi*), common bullies (*Gobiomorphus cotidianus*) and giant bullies (*Gobiomorphus gobioides*) that are key components of the riverine faunas, and
- *black flounder* (*Rhombosolea retiaria*) a popular target for net fisheries in the coastal lakes and river lagoons and estuaries.

All of these, without access to and from the sea at the right times of the year, will fail and disappear from our rivers. Rivermouth closure is thus a major threat.

And, of course, there are now the acclimatised salmonid fisheries:

- *brown trout*, already mentioned, that move in and out of coastal rivers to feed, and migrate up stream through the rivers to spawn in the headwaters
- *Chinook salmon* (*Oncorhynchus tshawytscha*), which are perhaps the most popular sports fish, with hundreds, even thousands of anglers lured to the rivers by the potential to catch fish weighing up to 20kg or more. The salmon too need to be able to move in and out of river systems to complete their life cycles, and for them the great irony is that their period of chief migration is the late summer and autumn, at precisely which time the pasture and croplands of Canterbury are at their driest and most in need of irrigation.

So, there is great potential conflict for these precious river flows - a conflict between the recreational and conservation aspirations of anglers and conservationists, and the economic needs of farmers and rural communities. The National Conservation Order that was granted for the waters of the Rakaia River affords some protection for that river’s flows, but other rivers are not protected and remain vulnerable. Some are already heavily abstracted leading to the mouth closures mentioned earlier. And the ground waters of the Canterbury Plains are sucked up from deep in the gravels of the plains and spread across the land, in lieu of surface waters from the rivers. The deeper the wells have to go, and they are getting deeper all the time (all the “easy” water is already harvested), the greater are the costs of installation and operation, including huge electricity bills for pumping the water. Even the Rakaia Conservation Order could be amended in the future to allow water to be taken for irrigation, if enough pressure is brought to bear by farmers and politicians. Though we can be sure that there will be prolonged legal battles,
fronted by the Fish & Game Councils, before any such changes can be instituted.
The balance between wetland and riverine faunas of the Canterbury Plains changed very rapidly during the last third of the 19th century. Since then change has been slower, but perhaps just as insidious as remaining undeveloped fragments were attacked and turned into pasture. We can be sure that it will continue unless there is a will to ensure a shift in the balance between conservation and development that considers the needs of aquatic fauna. As far as the Canterbury mudfish is concerned it is not all that far from “too late”. The viability of the highly popular Chinook salmon fishery, supported by valued estuarine trout fisheries, whitebait and eel fisheries, are of key importance.
They are all a part of our heritage that deserves to survive. Protection of the remaining wetlands, and ensuring that adequate flows remain in our rivers are the keys to this survival and require careful vigilance by all those interested in these values.
2.2 When to stock and when to stop!

Fish and Game 31, 2000

R M McDowall takes an overdue look at the stocking of our rivers, lakes and streams with trout and asks if anglers and fisheries managers devote enough time, energy, research, and money before undertaking decisions about stocking.

Stocking trout in New Zealand waters has a long and venerable history. Had we not stocked our rivers and lakes with trout (at least some of them) in the earliest colonial years, then we would never have had any trout fisheries at all.

However, with their natural predilection for going to sea, brown trout rapidly moved around the coastline and invaded our river systems, becoming widespread in accessible waters wherever conditions were suitable (some argue that because this spread took place, homing does not take place in brown trout, but that argument is fallacious - only a small proportion stray and most do home). Natural spread did not take place with rainbows, however, since they never developed sea-migratory stocks, and their distribution has remained limited to rivers where there were releases and where conditions have remained suitable.

Once trout had become established here, it seems to me that our predecessors in the trout fishery business had difficulty believing that our rivers could possibly continue to sustain trout stocks without their human help (a curious sort of colonial arrogance). And so, if we explore the annals of trout/acclimatisation society history, we find an ongoing emphasis on stocking. There is a quite detailed account of this in chapter eight of my book ‘Gamekeepers for the Nation’. In brief, most acclimatisation societies had trout hatcheries – there were dozens of them, and were a sort of status symbol among societies –, and they oscillated erratically through a series of stocking strategies, varying from: 1) planting ova; 2) releasing fry; 3) releasing fingerlings; and 4) releasing yearlings, shifting from one to the other, from time to time, and for ostensibly sound logical reasons (typically that the current strategy was not working, was too expensive, or was too much work, but seldom with any objective evaluation of what was happening or what was needed). Sometimes societies hedged their bets by making several different sorts of releases.

This is epitomised for me by what happened in North Canterbury - where the Society plundered the trout stocks of the Selwyn River to get ova, variously to raise stock for release in their own district or to sell to other acclimatisation societies (for details see my article on the Selwyn in Fish & Game New Zealand Issue 26, 1999). They took several million ova a year, for decades, but seemingly always felt a little guilty about doing so and, to appease their guilt, habitually returned some thousands of fry or fingerlings to the river. BUT: firstly, they never had any idea of the size of the trout stock in the Selwyn, and so did not know if the river could afford to go on providing several million ova a year; secondly, because they did not know the size of the fish stock, they did not know whether returning a few thousand fry/fingerlings/yearlings to the river made any difference to the river’s trout stocks and thirdly, they had no idea whether the released fish even survived. The Society’s attitude, in the language of a well-known drink advertisement seems to have been: “It’s got to be good for you.” Well, in the 1940s the Society, probably urged to do so by Derisely Hobbs, finally decided that it ought to find out what was going on, and trapped the Selwyn spawning run. In one year, they estimated the spawning run as no less than 65,000 spawning fish, which would have produced around 90 million ova! So, even though this might have been an exceptional year, it certainly places what was going on in perspective, doesn’t it? Neither the removal of a few million ova a year, nor the return of a few thousand fingerlings to the river, were likely to have had any impact at all.

To understand history, and the management of our trout stocks, we really need to go back to Derisely Hobbs’ work on trout fisheries in the 1930s and 1940s - interestingly, Hobbs came from North Canterbury. Hobbs attempted to make an objective evaluation of how New Zealand’s trout fisheries function, and he soon found that, in general, the numbers of ova produced vastly exceeded both the
needs of the river system/trout fishery and any potential effects from the levels of hatchery releases that were customary in New Zealand. His ideas were revolutionary, not just in New Zealand, and his work is cited all over the world.

Given all this history, how do we decide whether to stock water, or not? For most people, stocking seems a response to their feeling (rarely objective knowledge) that there are not enough fish there. For some anglers, of course, there are never enough. And in some instances, stocking is for sociological rather than biological purposes - management agencies do still undertake some stocking just to keep the anglers happy.

1) Are there really not enough fish? and 2) If so, why not? I’ll again dispense with the first of these and concentrate on the second.

Sometimes there is inadequate juvenile recruitment. This, in turn, could be due to:

- lack of spawning fish – the adult stock is not large enough. In this case, stocking could be useful, but only if the lack of adult stock is not related to the inability of the fishery to produce adult fish. If there are not enough adults there because conditions in the river won’t produce and support juvenile growth and adult fish, then why would releasing fish make any difference and overcome that problem? Simply, it won’t.

- lack of spawning habitat – there is nowhere for adult fish to spawn. Clearly, here, there is a case for stocking, but only if the river/lake system would otherwise support a stock of adult fish. This is true, for some lakes that lack tributaries, and for some river systems that lack spawning gravels, especially where the geology consists of soft sedimentary rocks that do not form the hard rock gravels that trout need for successful spawning.

- unsuitable hatching conditions – as when waters are too warm, or there is excessive siltation of the spawning grounds, but only if those same conditions do not also prevent the growth and maturation of the fish. It seems likely that if temperatures are too high in the winter for egg development, they will also be too high in the summer for juvenile/adult survival, or that if there is too much siltation for egg development, there will be too much for food production for the juvenile/adult trout growth, and so on.

In general it is, I think, true to say that the headwater/spawning habitats in New Zealand rivers are in better condition than the lower reaches where adult trout often live and where many anglers seek to catch them (there is presently real concern about trout stocks in lowland rivers all over New Zealand). I suspect that it is mostly not inadequate conditions in the headwater spawning habitats that are limiting our trout populations, but there are no doubt exceptions. The key point is that we need to know!

If inadequate trout stocks do not result from limitations in spawning – and Hobbs’ work suggests that in general there is plenty of ova production in most of our rivers – then there must be factors limiting stocks elsewhere in the trout’s life cycle, such as inadequate/unsuitable juvenile rearing habitat or inadequate/unsuitable adult habitat.

The problem could be food shortage, or the wrong sorts of food organisms, resulting from siltation of the substrate, or from pollution/eutrophication (which may affect both trout directly as well as through their food supply), or habitat perturbation.

Habitat may be inadequate as a result of water abstraction further upstream, or changed flow patterns filling in the pools, or, or, or ...

Or there could be other influences.

Again, we need to know. How do we find out? Research is needed and I suspect that at this point some readers will groan and say that researchers always say that more research is needed. But it is true. Research is costly, but then so too is stocking. For some, money spent on research seems a bit like throwing good money after bad in the sense that often nothing definitive seems to come out of it, and/or that the answer the researchers produce are inconsistent with the pre-existing notions that are prevalent at the time.
But think about it for a minute. Isn't stocking even more like throwing good money after bad, if all that is happening is that the fish being released are encountering the same factors that are limiting the wild stocks and are dying in droves, probably sooner than wild fish?

If the reason why a river is not well stocked is that there is too much siltation as a result of forestry activities further upstream, what chance do native hatchery-reared fish have when liberated in that river, if the wild fish cannot make it? Not much, I reckon.

And, of course, the fishery may be being overfished, and this is likely one of the big differences from Hobbs’ day, when few if any fisheries were overfished, but there seems some evidence that this is true, for instance, in Taupo, today. Did you know that there was a time in the 1950s when there was no limit bag at Taupo? Maybe there is a case here for stocking. Maybe!

How should the fishery manager respond? I do not claim to have raised all the issues that need attention in addressing the question of whether to stock or to stop. What I am trying to do is indicate the sorts of logical processes that must be undergone if a rational decision is to be made. The absolutely essential and fundamental issue is to determine what is limiting the fish population in the river/lake under consideration. Some fisheries biologists talk of “bottlenecks”, these being points in a fish population’s life cycle that are limiting production, or when major mortalities take place (not enough adult spawners; not enough eggs deposited; poor egg survival; poor fry juvenile survival; poor adult survival; predation; disease; overfishing; and so on).

Having decided which of these is (or are) relevant, then it is equally essential to determine why this limitation exists. Once it is known why, then it is again essential to know whether, or not, stocking would simply expose the fish being released to the same limitations, and thus lead to their poor survival.

Furthermore, having discovered what is limiting the population, before any stocking should be contemplated, there needs to be consideration of whether, having nursed the population through one bottleneck by stocking, there will not be another equally crippling bottleneck further down the fish’s life cycle that will be equally crippling for the population. Let’s take a hypothetical example. If it is concluded that inadequate trout numbers result from siltation in the headwaters smothering the trout redds, causing egg mortality, then it might be concluded (and perhaps reasonably), that this problem could be solved by making fry releases. However, that same siltation may well be causing losses of both food and suitable habitat for the young fish (perhaps being released). If so, releasing fry could be a total waste of time and money. So, maybe the answer is to release fingerlings instead of fry? Well, perhaps, but what about food and habitat for fingerlings? And maybe the same siltation also causes juvenile trout mortality? And, similarly, food and habitat for adults. Hard questions with no simple, easy answer!

In the end, a fair amount of careful scientific judgement is called for; perhaps also for some experimental releases - but only if there is careful scrutiny of the results of the experiments, so that both the value and costs of the releases are explicitly known.

In the final analysis, the question is also one of economics. Does the return of fish to the angler justify the cost of the releases? Do anglers really support hatchery releases that are generating fish catches to the angler at a cost of $10, $50, $100, and yes even $1000 per fish? In the past, such questions have too often been comprehensively fudged. Managers have usually not known the real cost of rearing and releasing the fish, mostly because they have not tried to find out. I suspect this was mostly because the managers /anglers really did not want to know. That is, the cost was so high that they would sleep better at night not knowing. But in addition, we have not invested enough in finding out what the effect of stocking has been. How many hatchery fish were caught by anglers as a result of stocking? And then, combined with the actual costs of the releases, what is the cost per fish caught?

There is perhaps – and I mean perhaps – one caveat to all this. Possibly – and I mean possibly – there might – and I really mean might – be a case for a short-term injection of hatchery stock into a river system that has suffered catastrophic losses, to hasten its recovery. But it is crucial that any releases be delayed until the effects of the losses have been dissipated. Moreover, my guess is that in any trout
fishery worthy of the name, recovery will already be being pushed to the limits of the ecosystem to support more fish by the fish themselves.

Some anglers scorn others less “skilled” and “refined” than themselves, scoffing at spin fishers or trollers as “chuck and hope” fishermen. Well, I think some of those same anglers support hatchery releases that can just aptly be described as “chuck and hope”. Trout fisheries management in New Zealand can no longer afford such excesses. There are far more important things on which to spend valuable licence revenue (like habitat protection and restoration - but I’d better not get onto that hobby horse).

There is still a modest amount of hatchery stocking going on in New Zealand, most of it into small lakes where spawning is deficient. It would be a really interesting exercise to undertake a biological and economic analysis of all trout stocking undertaken in the country, so that we really know:

- what stocking is being undertaken
- what the impacts of this stocking are on the receiving waters, in terms of survival and return to the angler
- what the real cost of the hatchery production is
- what the cost per fish caught is.

My guess is that there is not enough information available to answer points 2, 3, or 4. If there isn’t, then one might seriously ask how such continued stocking can be justified. There is an interesting challenge for the national and regional Fish & Game Councils.
2.3 A hatchery for Lake Dunstan?

*R M McDowall* looks at the history behind the moves to have a hatchery at Lake Dunstan and suggests that, since some experts say stocking is not required to maintain a fishery in the lake, money earmarked for a hatchery could be better spent.

The political shenanigans surrounding the environmental debate and approvals for construction of the Clyde Dam on the Clutha River in Central Otago are generally well known history. Almost as well known is the vast expenditure incurred in construction works, firstly associated with building the dam, and then dealing with geological faults in the surrounding hills and stabilising the hillsides on the shores of the formative lake to prevent landslides that could threaten the dam itself. Now, where there was once a picturesque river gorge, a fast-flowing, tumbling river and the small old gold-mining town of Cromwell nestled in the confluence of the Clutha and Kawarau Rivers, there is a large lake, a few remnants of the old town that had been built above the new lake level, and a new, bustling township along the lake shores. The new town sits in the “V” of the lake, with arms named for the former rivers that drained through them - now the Clutha and Kawarau Arms of Lake Dunstan.

When negotiations were being undertaken with the former Electricity Corporation of New Zealand, to ensure that environmental damage resulting from constructing the dam was minimised (or compensated for), the former Wildlife Service of the Department of Internal Affairs agreed to withhold objections to the dam and the resulting lake on condition that a large fish hatchery would be constructed at ECNZ expense to provide fish for stocking the proposed new lake (and other lakes then planned for the Clutha River). This was to be a substantial and expensive hatchery, with grandiose plans for establishing a series of distinctive salmonid populations in the various lakes, to be stocked with one or other of rainbow or brown trout, Chinook salmon, Atlantic salmon or mackinaw. Elaborate facilities were planned to provide a visitors’ centre to cater for tourists. The hatchery’s cost was estimated at several million dollars at 1980s prices, the actual cost depending on where the hatchery was to be sited. An existing Wildlife Service hatchery at Wanaka was deemed inadequate to meet the Service’s ambitious plans - its water supply insufficient and the site in close proximity to Wanaka town and likely to be encroached upon or surrounded by domestic housing.

There were problems finding an alternative site, and there were plans at one stage to derive water from the lower levels of Lake Dunstan itself and pipe it to the hatchery at an additional million dollar (or more) cost. An alternative site was identified at the mouth of Wye Creek, along the eastern shores of the southern limb of Lake Wakatipu towards Kingston. Here, water could be piped from a small lake that feeds Wye Creek.

Examination of the Wildlife Service hatchery proposal prompted serious scepticism amongst fisheries biologists that this expense could be justified. The need for a major hatchery was certainly dented when it became clear that, at least in the short and medium term, only one dam would be constructed, making recruitment into the single lake from upstream lakes fairly easy. Had there been a series of lakes in the upper Clutha valley, recruitment into the lower lakes (those more isolated from the source lakes and their spawning grounds) would have been more difficult, increasing the need for a hatchery, perhaps. But there was also disbelief that the proposal to maintain different fish stocks in the various planned lakes was practicable. These concerns were conveyed to government agencies and interdepartmental committees that were involved in planning the dam and in ensuring that environmental damage was minimised. Specifically, the belief was that Lake Dunstan would be stocked naturally by downstream movement of salmonid species already widespread and abundant in the Clutha River above the proposed dam site. Prolific brown and rainbow trout stocks populate the Clutha and Hawea Rivers, and both these species, as well as landlocked Chinook salmon, also support fisheries in Lakes Wanaka, Hawea, and Wakatipu at the top of the Clutha.
It was already well known that Chinook salmon emigrating from these lakes move downstream into the Clutha and find their way into Lake Roxburgh, further down the Clutha - Lake Roxburgh has long been recognised as supporting an intermittent but sometimes productive fishery for landlocked Chinook salmon in the summer. It was a fair assumption that the Clyde Dam would terminate these downstream salmon migrations and that Lake Dunstan would be the beneficiary - a comparable salmon fishery in Lake Dunstan seemed a likelihood. It was thought, also, that brown and rainbow trout would similarly move down into the new lake and naturally establish a fishery there. So who needed a hatchery?

Otago Fish & Game Council, in whose district the Clyde Dam was sited once the acclimatisation society movement was reconstructed in the early 1990s (and which became the manager of any salmonid fishery that developed in Lake Dunstan), followed its predecessor the Otago Acclimatisation Society in abandoning hatchery production and stocking as an economic and sustainable way of maintaining most of its fisheries - apart, that is, from stocking in some small high country dams and lakes that lack spawning tributaries.

In general, most of the acclimatisation societies/fish and game councils throughout the country had long learned that stocking was unnecessary in most New Zealand waters and saw the return to a “put and take fishery” being proposed by the Wildlife Service for the upper Clutha hydro lakes as a step back into “dark ages” trout fishery management.

Criticisms of the hatchery proposal and concerns being expressed about the plans generated outrage among senior Wildlife Service administrators in Wellington, who accused their critics of meddling in others’ business. But the government of the time could see past the accusations of meddling recognised the possible validity of the criticisms, and decided that they should at least be examined. Moreover, all of this was developing at a time when New Zealand was being “restructured” in almost every way possible by the Labour government of the late 1980s and early 1990s, and among the changes being proposed was a reorganisation of the management of salmonid angling and gamebird hunting in New Zealand.

There was clearly an aspiration within the Wildlife Service’s senior management that its model of management (government-managed conservancies with government-employed staff and government-controlled funding - overseen by conservancy councils with some angler-hunter input) should be extended to the whole country. In that eventuality, Lake Dunstan would have fallen into the hands of the agency that some planned as ultimately to replace the Wildlife Service - articulated in a revealing Wildlife Service publication called “A Model of its Kind”. As it transpired, this was not what happened at all - the structure eventually approved by government was quite the reverse: the now-existing Fish & Game Council structure was instituted, and is basically a reformed acclimatisation society structure that might have been entitled “A Model of the Existing Kind”!

As a result of all this, had the proposed hatchery been constructed, at Wildlife Service instigation, it would have been sited in what eventually became part of the district of the Otago Fish & Game Council. If Otago did not want such a hatchery building it made no sense at all - economically or biologically.

However, included among the conditions for constructing the Clyde Dam (contained in explicit empowering legislation) was a condition that a hatchery must be constructed. Opposition to the hatchery left ECNZ in a difficult position as it was required by law to build a hatchery that no-one involved in managing the fishery likely to develop, seemed to want. Over a series of months, negotiations were undertaken that provided a solution to this dilemma, and this led to the establishment of the ECNZ Clutha Fisheries Trust. Money that had been set aside for construction of the hatchery - $2.7 million - was given to the Trust, subject to conditions specified in the Trust Deed, of which more below. The dilemma of ECNZ legally having to build an unwanted (and predictably unnecessary) hatchery under the conditions of the Clyde Dam empowering bill, was solved by the Otago Fish & Game Council and ECNZ going jointly to the Otago Regional Council and seeking a variation of the hatchery condition in the empowering act. The Otago Regional Council had power to do this as the agency responsible for managing the Clutha River - it was that Council that issued the resource consents for construction of the Clyde Dam under the dam’s empowering act.
If all this seems complex and tortuous, well it was, somewhat, but in the end with goodwill and common sense, all the obstacles were overcome. The necessary variation was granted, in turn subject to conditions in the trust deed. The Otago Regional Council agreed to vary the conditions associated with construction of the hatchery, and a Trust was established. Trustees were appointed, as specified in the trust deed, and comprised nominees of the following: Minister of Conservation (1 nominee); Minister of Fisheries (1); New Zealand Fish & Game Council (1); Otago Fish & Game Council (2 - one of which was usually the Chairman of the Fish & Game Council). In the early years of the trust, secretarial services were supplied by the Otago Fish & Game Council (Council Manager, Niall Watson). Later, the Trust appointed its own field officer (Aaron Horrell), based in Cromwell. Individuals appointed by these various nominees have been as follows (in the order listed above): Murray Neilson (DoC Conservation Officer, of Dunedin), Bob McDowall (NIWA Fisheries Scientist of Christchurch), Donald Scott (retired University Professor and member of the Otago Fish & Game Council), have all been trustees throughout the existence of the trust; OFGC members have variously been Council chairmen Dan Lyders, John Barlow, Dan Rae (presently); and Dick Marquand and Dave Murphy (now Trust chairman).

It remained uncertain that the hatchery would not be needed (though some biologists were convinced that it wasn't), and the trust deed specified that this was a question which needed to be resolved. If research indicated that, in fact, the critics of the hatchery proposal were wrong, and stocking of the lake on an enduring basis was necessary to maintain a fishery, then the funds in the control of the trust could be used to build the hatchery. If no stocking was necessary, the trust deed provided for the funds to be used for enhancement of fisheries and wildlife values around Lake Dunstan and more widely in the Clutha River valley. Very quickly the trustees decided that the trust fund should be invested to generate income and that it would be that income which would be spent on the lake and its fishery. Moreover, it was decided that the capital value of the trust fund should be protected for the future against inflation. Thus the sum available at the outset would be available, in current dollar values, for the future should a hatchery really be needed - which is conceivable, for instance, if another dam is built at Luggate or Queensbury, isolating Lake Dunstan from downstream moving fish recruiting from the upper lakes of the system (Wanaka and Hawea). As a result of inflation protection the trust now has around $3 million invested. Over the years since its establishment, it has spent available additional funds on investigating the fish populations of the lake, as these have developed and stabilised since the lake was filled, and in promoting Lake Dunstan as a fishing spot for local and visiting anglers. The results of this research, and the fishery that has developed there, will be discussed in a second article but, in brief, this work supported the views of the critics that no stocking is needed to maintain a fishery in the lake.
2.4 Hello there possums!

*Fish and Game 35, 2001*

R M McDowall unravels the full, in depth story of how a marsupial, once considered by early experts to be “valuable and harmless” and thought to be of “negligible” harm to our forests, has instead become uncontrollably destructive to the bush of godzone over the last 160 years.

Calling someone “possum” might be a Dame Edna You-Know-Who’s form of endearment for her Australian fans, but it is unlikely to generate the same feelings here in New Zealand. As we look back at our history of animal and plant introductions, including that of the brushtailed possum from Australia (called possum, not opossum, the latter name being reserved for the distantly related and rather different North American marsupial), we have good reason to despair at the actions of some of our forebears. Though we ought not be too critical for a number of reasons. One reason is that people around our country are still introducing species into new habitats, without any evaluations or assessments of impacts in just the same way as they did in the mid-1800s. Makes you wonder, doesn’t it? A second reason not to be critical is that what was done in New Zealand in the 1800s was being done all over the world, and furthermore, it was done with the general approval of both colonial government and the settlers. Sadly, the outcome of many of these introductions has been devastating impacts on the native biota and environment.

Among the most devastating introductions has been the possum. As we look back, we might wonder why anyone would introduce the Australian possum here. It is a long story that some believe began with a man named Christian Bastian, who is said to have liberated possums into the Southland bush as early as 1858. However, other evidence suggests that some had been introduced before 1840. Note that these earliest introductions had nothing to do with the colonial government, nor anything to do with the acclimatisation societies, as none were then in existence. However, this lack of government and acclimatisation society involvement was not to persist for long - in just a few years they began to play a major role in introduction, dispersion, management, and exploitation of the species.

When you see attractive ‘Davey Crockett’ hats (as I did on television the other night), or see rugs made of possum fur in the tourist shops, it is easy to imagine why the animal was brought here - to support a fur industry. The acclimatisation societies, soon after their formation, beginning in the mid to late 1860s, began importing both the Victorian grey possum and the Tasmanian brown variety, and both colour morphs can still be seen around New Zealand. The societies quickly recognised the potential for a fur industry, and were joined by the government. Thomas Donne became a promoter of possums through his position in the Tourist Department and made possum releases around Rotorua during the early 1900s. Once here, possums were spread rapidly and widely around the countryside, both by those with an official interest in them and by private individuals. In addition, of course, to their natural dispersion. And if you sigh with relief when you think that this spread is no longer taking place, then you need to think again. When I first began whitebait research in the Haast area during the late 1960s and early 1970s, there were no possums south of around Paringa, where the West Coast road ended until the extension around Knights Point and south to Haast was put through. Local Haast identities are believed to have shifted possums to south of Haast at around that time in an ill-considered attempt to provide themselves with alternative ways of scratching a living, when deer shooting, whitebaiting, cutting silver pine fence posts from the bush, and work at the local timber mill was not providing them with an income.

The colonial government surrendered control of the exploitation of possums to the acclimatisation societies in 1894. In those early years, there was a general perception that having possums in the forest was not doing any harm. The Wellington Acclimatisation Society, for instance, pontificated in 1892 that “the opossum need never be regarded as a pest in New Zealand”, and was later even more confident, and thought that the skin was “so valuable that the regulations for capture [could] easily be made wide enough to prevent these animals ever becoming a pest”. How wrong they were! And Wellington was
not alone, its Auckland counterpart thinking that it would be doing “a great service to the country” by stocking possums, which it considered “valuable and harmless”.

Controversy began to develop quite rapidly, however, part of it stimulated by the fact that possums were becoming a nuisance in orchards, around farms, and in gardens. And something of a battle developed over how possum populations were to be managed. One of the issues was that the groups likely to benefit from possums - the societies and trappers - were different from the groups being troubled by them - orchardists and farmers. During the early 1900s, there was debate leading to possums being declared imported game in 1911, the implication being that a licence was required to trap them. The government of the day, then found itself rather the “meat in the sandwich”, under pressure from the societies to spread the animal more widely and to facilitate proper management. Whereas farmers sought to limit dispersion and wanted to control the populations on their properties. A deputation from the acclimatisation societies to the Minister of Internal Affairs sought to maintain protection and resulted in a piece of wonderful, political pragmatism and circumlocution from the Minister, who said that “if he found it possible to do what the [societies] suggested, he would do it, but if it appeared that the only course was to withdraw protection [of possums] it would have to be done”.

What in fact happened was that the government removed protection from possums in 1912, under pressure from orchardists and farmers, but then collapsed under pressure from the acclimatisation societies in 1913, when possums were again declared protected game - though only in the “bush covered regions” away from towns and orchards. Proponents even argued that the income from possums on a block of land could exceed that from sheep and, moreover, that possums ate less than sheep. Various government departments adopted contrary positions. The Agriculture and Tourist Departments joined the acclimatisation societies in favouring possums; whereas Internal Affairs, the Forestry Branch of Lands and Survey, and also the Forest and Bird Protection Society opposed their spread.

Meanwhile, the acclimatisation societies, nationally, began ‘managing’ the populations and, it must be said, making a lot of money from possums. Consistent with views that possum fur was a valuable commodity, pressure quickly developed to allow legal and controlled trapping of the animals. There was concern that to allow trapping too soon might prevent them becoming properly established. But in 1921 trapping was approved. Trappers had to purchase a licence that cost £2 10s ($5 in today’s currency, though not today’s value!). And there was a levy of a shilling a skin to be paid to the societies, which ran a skin-stamping scheme to ensure that all skins were levied. In addition, skins had to be marketed through licensed fur brokers, all this being an attempt to minimise illegal or unlicensed trapping. There was at one stage concern that skins were being exported as cat skins and also that there were huge stockpiles being stored awaiting the legalization of possum trapping. The outcome of this was that possum licences and levies became a major source of Society income. The downside of this was that, at times, the Society rangers were doing little other than ranging and stamping the skins. To place the role of possums in the societies’ earnings, in perspective, in 1923, the Wellington Acclimatisation Society sold 125 licences and received levies on 17,000 skins. The numbers in 1924 were 282 licences and 43,000 skins. Looked at in the context of acclimatisation society funding, the Wanganui Society’s income in 1923 comprised about £46 from fish licences, £49 from deer licences, £127 from game licences, and £163 from possums. In the view of some observers, possums had become the main source of revenue for the societies and, that being so, it is no wonder that the societies were supporters of possums, even when, for a period, they had to share the revenue 50:50 with the government’s Forest Service (was this, perhaps, tacit recognition of the “cost” to the forests of having possums there?).

It seemed to the societies that numbers were declining in the early 1930s, and they requested a closed season for 1931. But the government refused. However, there were closed seasons in 1932, 1933, 1937, and 1938, with the aim of ensuring that possum numbers did not decline.

During the early-mid 1930s, the acclimatisation societies founded trout fisheries research in New Zealand through the former New Zealand Acclimatisation Societies Association. Later in that decade,
however, they found that carrying out research was becoming too much of a burden and the societies asked the government to take this over (see my article in Issue 33 about Derisely Hobbs). Part of the government response was to demand that the Societies paid part of their possum licence and levy revenues to the government to fund fisheries research. Seeing an increasing amount of the funds disappearing into government coffers, the Societies began to grumble, finding that they had to administer possum trapping - involving the control and licensing of trapping, ranging, inspection and stamping of skins - but the government was getting most of the money. The Auckland Acclimatisation Society's assessment was that in 1937, on royalties of 137,000 skins, the government got £5000, but the Society only about £1000.

Meanwhile, there was growing concern about the impacts of possums in New Zealand and here we come to the heart of this story. Initial impacts, as mentioned above, were perceived to be primarily in orchards and around farms and farmers began to complain - and not without reason. They began to oppose promotion of possums by the societies, supported by Internal Affairs. The opinion of various experts was sought. Biology Professor Harold Kirk, at Victoria University College, considered damage to the forests negligible, and thought the value of possum outweighed the harm. He suggested that the animals be released away from orchards and other places where they might be a nuisance (as if they would stay there!). A forester, A.N. Perham, found minimal evidence of damage and even Leonard Cockayne, perhaps New Zealand's greatest forest ecologist, thought that if the possum was doing any serious damage in our forests, "the forests would undoubtedly point to this in their dead trees". Moreover, he thought that if they did prove to be damaging, the numbers of possums would be reduced in numbers at no cost.

How wrong, yet how right Cockayne has proved to be. Right that if possums were causing damage, it would be evident in dead trees, but wrong that they would not cause damage, and even more wrong that their numbers could be controlled and at no cost.

 Debate continued for several decades. An interesting combatant in this debate was Edgar Stead, a man who was a long-serving North Canterbury Acclimatisation Society Councillor, but also a noted ornithologist and conservationist. Stead feared extinction of the kaka, should possums become too common and widespread. In response to claims that trapping possums might lead to deaths of native birds, long-term New Zealand Acclimatisation Societies Association President Leonard Tripp, retorted that "returns from 1000 trappers showed that something like 14,000 rats, 2000 stoats and weasels, 348 hedgehogs, and 1400 blackbirds and thrushes, but only 35 native birds, had been taken". Where these figures came from is lost in history.

During the 1940s, the case against possums gradually strengthened and in 1947 all legal protection of possums was removed (and with that, any interest by the acclimatisation societies evaporated). Soon afterwards, the Department of Internal Affairs, with responsibility for wildlife conservation and long opposed to possums, offered a bounty, paying 2s 6d for each animal killed. And to prevent trappers getting both the bounty and the value of the skin, the bounty was paid on submitting the ears plus a connected strip of skin down the back. Whether it did any good is at best debatable and more realistically unlikely, and before long the bounty scheme was abandoned. It had probably become obvious that the bounty was achieving little or nothing other than providing a useful source of pocket money for country boys.

Over the decades, huge numbers of possums were taken from the New Zealand bush. Records show that in the period 1921-1970, about 12 million possums were trapped, and from 1970-1983, around 24 million. And as the years have passed, the damage and trouble they have caused has been increasingly realised. As Cockayne prophesied, if possums were causing damage, this would be evidenced from dead trees in the forest - and they can be seen in many areas, especially rata. In addition, possums are a threat to farming, as they spread bovine tuberculosis. There is perhaps a negative synergy between the damage caused by possums in the forest canopy, and deer, with their impacts on regeneration. And increasingly, their threat to indigenous birds is being recognised, as they are shown to steal eggs from bird nests.
The Wellington Acclimatisation Society sought advice from Australia, where, of course, our possums originated and was told that the possum could not possibly become a threat like the rabbit. Rather, the Australians advised, the Society should “cherish the possum as a fertile source of revenue and therefore a most desirable colonist.” Let me close this article with that Society’s summation. It described its involvement as: “One of the darker pages of the Society’s history ... In fairness, it is obvious that the Society relied upon the best advice it could obtain before accepting this “Horse of Troy”.

Today there are scores of millions of possums in our forests and through the farming countryside. Like so many other introduced pests, they are probably with us forever. Some value is obtained from skins and furs and the development of a mixed merino wool and possum fur fibre may be seen by some as one way of extracting value from this troublesome animal. Perhaps that is true, but it is unlikely to either make any significant impact on possum populations over the broader scale, nor to significantly recompense our country for the burden it has imposed on our wildlife and forests.
2.5 Don’t just think about it

Fish and Game 36, 2002

R M McDowall discusses environmental monitoring and asks if anglers are doing enough as watchdogs of our fishing rivers.

When I was a little boy, one of my favourite stories was about Epaminandros. This story would be regarded as seriously politically incorrect these days, but it was not so 50-60 years ago, when the innocent ears of a little fellow were being seriously polluted by listening to stuff. I can’t seem to have suffered much (but you may think differently!). Anyhow, to those who find the story offensive, as I relate a little of it, my apologies, but the story has, I think, something to teach us.

Epaminandros was a little black American, perhaps now known as an African American (actually the story described him as a negro, dare I say it), and he lived with his Mammy in a two-storied white house with red doors and windows at the end of the street. One day, Epaminandros’ Mammy had to go out, and she asked the little fellow to watch his baby brother, which he of course promised to do. And so Mammy went out, and Epaminandros, true to his word, began to watch his baby brother. Baby brother toddled off down the path and out the front gate - and Epaminandros watched him. Then baby brother crossed the footpath and began to walk down the street - and Epaminandros kept on watching him. Baby brother continued walking down the street, and came to a bit of a slope so that gradually he disappeared from sight. So Epaminandros went upstairs and watched baby brother from there, for as long as he could, as he walked further and further down the street, until, eventually, he disappeared from sight. Epaminandros scratched his head and wondered what he should do now, but couldn’t decide, so he went back to his toys.

Some time later Epaminandros’ Mammy came home, and she asked him where baby brother was. Epaminandros told her that he had walked off down the street. At that point Mammy became quite upset and said to Epaminandros: “But I done told you to watch your little brother”. And at that Epaminandros became quite confused and said “But Mammy, I did watch him, very carefully, until he went out of sight, and then I couldn’t watch him any more”.

What has this to do with environmental monitoring? I guess the message is obvious.

When I first moved to Christchurch, from Wellington, in 1978, the local officials in the North Canterbury Acclimatisation Society (NCAS) invited me to do a quick, one-day trip around their district, to see what their rivers, lakes and fisheries were like, to get a feel for the geography, and also to obtain some understanding of the issues and problems that they were facing. (They were probably also “sizing me up”, having a healthy cynicism about government officials.) It was an interesting and enjoyable day, and I saw some interesting countryside, and we got to know each other, which proved very useful in the years to come.

NCAS in those days were involved in all sorts of rather long-term data collection. They had salmon traps operating here and there, did spawning surveys, and so on, and each time we came to one of these operations/localities, I would ask: “Why are you doing this?”, and some sort of explanation was offered. However, I got the distinct feeling that the principal reason why they were doing it this year might have been because they did it last year, and the year before, and the year before that… I asked the question I did for two reasons. One was that I wanted to understand the purpose of the operations, but I also wanted to determine the extent to which the survey work being done was meeting the information needed for the management of the fisheries. I got some pretty fuzzy answers.

I am a real believer in long-term databases, as they can be the means for determining long-term trends, and when the data are collected with care and insight, and on a consistent year-after-year basis, they often end up providing insights that would never have been imagined when the work began years before.
A few years later I was discussing some issues with the people from North Canterbury, and asked about the ongoing results from one of the survey programmes that I had been shown in that 1978 overview. I was told “We don’t do that anymore - you advised us to stop that?” And I thought to myself: “I did?” Not so - I had just asked perhaps searching questions about what was going on. And so North Canterbury had gone from:

• collecting heaps of data, perhaps without knowing really what they were wanting to do with the information once they got it to
• collecting nothing at all and not being able to achieve anything that the data would have demonstrated.

Today, one of the most valuable long-term data sets associated with freshwater fisheries in New Zealand is the Glenariffe salmon trap record. Begun in 1965 as part of the old Marine Department Technical Field Service programme, and extensively funded by a levy on angling licences (money paid to the government by the former Council of South Island Acclimatisation Societies), the Glenariffe trap has provided daily counts of all salmon running into the Glenariffe Stream for every year since. It may well be an internationally unique data set. And with the 2000-2001 salmon season being perhaps the worst on record, if it were not for the trap data going back 35 years, we would not be in a position to objectively compare the run this year with that from former years. After this year’s run is tallied, we will be in a position to say “Yes, it is the worst”; or “It was about as bad as the 1973 run”; or “It wasn’t quite as bad as we think”; or whatever. In addition, of course that dataset allows some investigation of whether there is a relationship between the salmon runs and climatic and oceanographic data that are all the time being collected. There is, for instance, a continuous-running record of water temperatures in Otago Harbour collected at the Portobello Marine Station of the University of Otago that goes back decades.

Moreover, because over the past few years, the North Canterbury and Central South Island Fish & Game Councils have made a determined commitment to aerial counts of all the important salmon spawning streams in the central South Island, not only are they able to compare the numbers among these streams for each of the past few years, but they will also have some perspective on how the changes demonstrated by the aerial counts across the years compare with long-term fluctuations in the runs, using Glenariffe as a baseline.

Now, this article is not about Glenariffe and the salmon runs. It is more about:

• environmental/population monitoring
• about the need for long-term databases, and especially
• about the need for these databases to be carefully structured to answer specific questions, and also about
• the need for them to be maintained on a long-term basis using consistent techniques that make year by year comparisons valid.

Collection of data of this sort is costly in both money and staffing terms, so it is absolutely crucial that important fisheries/environmental issues are being dealt with. But it is equally crucial that accumulating databases should not be something to just stand and watch.

There is presently a major public controversy about the decline in the condition of lowland Canterbury streams. This is partly a product of low flows that result from the summer drought. And it is partly about the increasing amount of dairy farming and its impacts on streams. But it is also partly about the failure of the local regional council, euphemistically called “Environment Canterbury”, to develop management plans for its rivers, and to enforce standards required of it under the Resource Management Act - they have yet to complete a management plan for any of their river systems, and yet continue allocating water from these rivers to out-of-river uses.

Epaminandros watched his little brother till he had moved out of sight, and left him to whatever fate little brothers suffer when they wander off from home. We, like Epaminandros, are in danger of watching our natural environment till it too, wanders out, of sight - down the gurgler.
But, I guess what most provokes me to write this article is the following. All over the country in response to the Resource Management Act and because the Ministry for the Environment is demanding activity on the environmental monitoring front and “state of the environmental assessments”, regional councils are undertaking all sorts of monitoring of the state of our rivers and streams.

My great fear is that they, too, will emulate Epaminandros, and just watch, while it all happens. Who is going to prevent that? Perhaps in an administrative sort of sense, it is the responsibility of the Ministry, perhaps the Parliamentary Commissioner for the Environment has a role, and maybe the Department of Conservation should be exercising a watchdog role, and be holding the regional councils to account. I am afraid that I don’t have a lot of faith in “bureaucrats watching bureaucrats”. In the long term, can we rely on bureaucrats to meet our aspirations in meeting their responsibilities? I suspect not. In fact, I very strongly suspect not.

The people who make most use of our rivers and streams are anglers - tens of thousands of angler days a year are spent on our rivers, according to angler-use surveys. Not only that, but in many ways anglers also have the most to lose. I can well remember, many years ago, long-term Ashburton Acclimatisation Society Councillor, Jim Tonkin, arguing in the fiercely passionate way only he could, that the anglers are the best observers of what is going on in our rivers, and are in the best position to advocate:

- for their protection
- for the maintenance of water quality
- for keeping the minimum flows as high as possible;
- for riparian protection, and so on.

Jim’s passion is needed more now than ever before, and we owe it to his memory. I know very well that there are some anglers who are “on the job”. But more effort is needed. Never before has there been so much pressure on our river waters. In a year when drought is accentuating the “need” for water on farmlands and crops, there are unprecedented requests for resource consents to abstract water from our rivers. Isn’t it too bad that all the energy funnelled into opposing trout farming and advocating stocking (there’s not much difference, you know) could not be harnessed and applied to ensuring the maintenance of stream quality?

Not long ago, a newspaper announced that Environment Canterbury has approved abstraction of an additional 17 cubic metres of water per second from the Rakaia River for irrigation. You might wonder how that is possible, given that the river is protected by a National Conservation Order. Well it is possible, because 17 cubic metres per second is apparently the estimated difference between the minimum flow set for the Rakaia by the NCO and the amount present in the river. We are all only too well aware of the request by the Fish & Game Councils for an NCO on the Rangitata River (well, I hope we are), driven again by the fears that it, too, will be sacrificed to the potential economic gain possible to the district from irrigation. And then there is growth and spread of dairying, which will bring string pressures to bear on both water availability and water quality. And so on, and on, and on. Arguments about so many hundreds or even thousands of extra jobs, and about so many hundred millions of dollars extra injected into local economies and similar sums in export dollars, are very hard to argue against, and in many ways, we would not want to argue against them. But, then, is that the whole story? What about quality of life? What about sustainability? What about natural resource conservation? What about instream values?

I am really concerned that we are too much stuck in the Epaminandros Syndrome - watching what is happening, maybe watching carefully and earnestly - but, I fear, watching our aquatic environment go off “down the street and around the comer” until we can see it no more. What are we, like Epaminandros, going to say when our proverbial “Mammy comes home” as she most assuredly will? Usually, there is no way back. Don’t just think about it.
2.6 Stop slagging the shag

*Fish and Game* 38, 2002

An anti-shag campaign, unofficial though it may be, recently erupted in South Canterbury and Otago. Concerned, emotive anglers and anti-shag activists reckon the protected birds are, as they have long been viewed by some, a menace to our salmon and trout fisheries. But R M McDowall contends much of this conjecture and criticism is ill-founded. McDowall sets the record straight.

I notice in the paper several weeks ago now that a fellow from South Canterbury has privately arranged the reprinting of a 1945 book called “The Shag Menace”, written by H.G. Williams, who was deeply involved years ago with the Otago Acclimatisation Society. The man who has arranged this reprinting is the same person who is on record as saying that some scientists think that the more they say something the more likely it is to be regarded as true. Interesting that – how does republishing the book fit in with such criticism?

This is the same fellow who was reported in the Christchurch newspaper as bewailing the fact that, when some thousands of salmon smolts, reared by the North Canterbury Fish & Game Council, were released into the Rakaia River: “if there are many black shags between the release point and the sea, very few of the fish will reach saltwater”. And he complains that the Fish & Game Council cannot provide “verifiable facts that shags and other predators are not the limiting factors” in our trout populations. Hmm! How many shags are there on the Rakaia? I don’t know. Does he? Doubt it. At what rate do shags present on the Rakaia prey upon juvenile salmon? Do they even eat any salmon? I don’t know of any evidence to show that they do. Does he know? Doubt it. I would have thought that it ought to be the accuser’s responsibility to prove that shags are having an impact on trout populations. One conjecture stacked upon another, it seems to me, aimed at raising the emotional level of antipathy towards shags, without any new information at all.

This fellow is not alone. There has always been an anti-shag (“Slag the shag”) lobby around, a bit like a rumbling appendix. Had my hair cut the other day and the barber, a keen angler, began grumbling about shags and I “kept my peace”, scared that if I disagreed with him I might lose a bit off my ear! Well, not really, but I avoided getting into a confrontation over the matter. The fellow in South Canterbury is only one of several activists seeking to spread negative opinions against shags.

Which shag are these people talking about? Is there an explicit focus on one species, or is it all of them that are at fault? Is the presence of shags around our rivers and lakes a new phenomenon? Were there no shags on our rivers in the good old days when the salmon limit was four or more, and when you could often catch your limit, or when some anglers could catch several hundred trout a season from the rivers of the South Island’s east coast? When shags were culled, did this actually make a significant difference to the numbers around? I’m no great fan of shags, but do they really deserve their reputation? What’s going on?

Traditionally, every hunter and angler seems to have a deep and passionate hatred of predators. Well, as they say: “It takes one to know one”. Global biodiversity, of which we humans are an ever increasing part, has never known a more ruthless and effective predator than the human being. So the ruthless effectiveness of the human predator, energized by a hatred of predators, has for decades been having profound effects on that global biodiversity. Anti-predator campaigns have been conducted for longer than any of us can remember. Such campaigns nearly exterminated the peregrine falcon in Britain (populations of this wonderful bird are now recovering), nearly destroyed the cougar populations of the Sierra Nevada in western North America and did exterminate it in Florida, brought the populations of giant condors to its knees in California, eliminated wolves from vast expanses in the North America west, and so on, and on. And, of course, keas were a target of the anti-predator brigade in New Zealand for decades and this resulted in major reductions in their populations. Interestingly, the decline in cougars and wolves in the Sierras resulted in such abundance of some deer species that they were virtually dying of starvation. Interestingly, too, huge funds have been applied to restoring the giant condor and
there is discussion of how best to restore the Florida cougar populations. I was reading in a magazine the other day about American media magnate Ted Turner’s passion for restoring natural ecosystems on some of his vast properties, including re-introduction of wolves. It might have been better, don’t you think, and certainly an awful lot cheaper, if these populations had not been destroyed, in the first place? Where does this passion for predator control or elimination come from? Some might argue that it has its roots in ancient Judeo-Christian “ethics”; you can read in the Old Testament book of Genesis (chapter 1, verse 26) that: “Then God said: ‘Let us make man in Our image, according to Our likeness, and let them rule over the fish of the sea and the birds of the sky and over the cattle and over all the earth, and over every creeping thing that moves on the earth’.

For some people this is a licence to kill or exploit. I know of a former West Coast forester who believes this and it translates, for him, into a human responsibility to cut down forest for humanity to use. Scary, isn’t it? So maybe our attitude to predators has these ancient cultural/religious beginnings. Maybe some of it translates from primitive human fears of predators that attacked human beings; or maybe it’s just a deep antipathy towards competition for access to prey species that humans need for food or want for fulfilling recreational pursuits. I don’t know the answer to these questions and maybe it does not matter – though I think it may. Whatever the reason, predators have long been under attack from humanity, on an almost global basis.

It has been little different in New Zealand and, if you go back through the annals of the acclimatisation societies, you will find persistent antagonism directed against eels, hawks, and shags. The numbers of hawks killed, and upon which the acclimatisation societies paid bounties, beggars description, and I shake my head in disbelief at some of the figures. Records show that in the period from 1922 to 1942, the Auckland Acclimatisation Society paid bounties on nearly 250,000 hawks. Where did they come from, you might well be asking, as I do?

Numbers killed in Otago at one stage prompted a member of that Society’s council to wryly suggest that the Society secretary should be complimented for counting the legs!

Data on bounties paid on shags are neither as explicit, nor as dramatic as those for hawks and, in fact, much of the shag destruction that took place at the behest of the societies was done by the rangers, who undertook shag culling operations in the river gorges, where shags seem to have abounded, especially at nesting time. What did this achieve? We have no idea, not a clue.

Shags have always attracted the invective of anglers partly, I suspect, because they are so brazen. A shag will dive right in front of you when you’re fishing, catch a fish, surface, shake its head as if to say: “Take that – I’m a better fisherman than you”. It will then manipulate the fish to get it head first and swallow it whole. That done, almost as if to “rub it in”, the shag might emerge from the water and perch on a rock, nearby, with its wings spread to dry in the sun, and quietly digest its latest meal, unimimidated by the angry angler. Not only has the damned bird taken a trout, but it has also disturbed all the others nearby, making them inaccessible to the fisherman. Stories of occasional shags with trout so big that they can’t swallow them only add to anglers’ fury.

Shags have always been there and are probably pretty much as abundant now as they always have been, though possibly less abundant, given the always increasing intensity of land development and land use around the country. Accusations that shags have increased in number have been made, but there are no data. How is it that shags are to blame now, even though in former years, despite the presence of shags, salmon and trout fishing were allegedly once much better than they are now? Curious, that. Why, suddenly it seems, have we (again) so much published antipathy towards shags? Partly, of course, like the shags themselves, the antipathy has always been there, smouldering away. But, it seems, this sort of campaign emerges when the fish populations are under stress, as it seems they are today, from habitat deterioration and heavy angling pressure. We seem to need something or someone to blame for things not being as we would like them to be, or not being as they once were, (or as we often, inaccurately, remember them as once being). We have to blame something and, at present, it seems to be the shags that are copping it.
And which sort(s) of shag species is (are) said to be to blame for this parlous state of affairs? The critics do not seem to focus their invective on any particular shag species.

Can any of them tell one shag species from another? Several of our shag species are described as taking small fish, like bullies and smelt. They probably take some small trout too. Where are there any data? And where is the evidence that they take enough trout to make any significant difference to the abundance of trout and other fish species out there, anyway? “Of course, they must”, some will argue, but I ask “Why, of course?” We don’t know – at least there are no scientific data on this question.

Eels are predators on trout too, and there have been times when destruction campaigns have been undertaken to control eels. Did these campaigns make any difference to the numbers of trout available? To the simple-minded, who have little or no understanding of the nuances of trout population ecology and the trout population pyramid of numbers, well, again, they say: “Of course they did?” “Why, of course?”, I ask, again. Recall that research showed that, when eels were removed, the resulting trout population consisted of larger numbers of much smaller fish that were of little interest to anglers! And, then, does the fact that shags prey on eels to some extent exonerate the shags because they are, in fact, removing the predatory eels? “Predators preying on predators” is a conundrum that the old acclimatisation societies never learned to grapple with effectively and it is probably no better today.

As I note above, campaigns against shags are not new in the history of angling in New Zealand. Let me remind readers of some of the sorts of things that have been said. In a letter to the Otago Daily Times, one writer pontificated: “Within the majority of shags there is nothing but obscene things and all manner of uncleanness. Are your correspondents aware that the shag is one of the best propagators of the tapeworm and similar parasites, being host to both adult and embryonic forms of these pests? If a colony of shags were to establish themselves in any of the so-called reservoirs ... the chance of an epidemic in Dunedin would be even more rosy than at present”.

Good objective stuff? These assertions are without the faintest shred of evidence to support them. So little did this writer know that he could not distinguish between a tapeworm and the nematode roundworm that shags carry and which is sometimes one of the concerns for anglers. This outburst stimulated another writer to described the shag as: “… without doubt the dirtiest, lousiest, most stinking creature we have in this country. So rank and full of worms is his carcass that the dogs or wild pigs would not eat it”.

Great stuff, again! Rational? Based on explicit evidence? The sort of information needed to drive management? I think not.

The question of the damage caused to trout stocks by shags was debated repeatedly at the meetings of the New Zealand Acclimatisation Societies Association over the early decades of the 1900s and it is interesting to note the stand taken at such meetings by Edgar Stead, a Canterbury Acclimatisation Society councillor and also a noted ornithologist. Stead’s pleas that shags should not be shot were greeted with derision. However, his concern that some shag species did not prey upon trout at all was eventually accepted and the NZASA did, at least at times, seek to focus their concerns on certain species – the large black shag (Phalacrocorax carbo), in particular, though the two smaller shags that frequent freshwaters, the white-throated shag (P. melanoleucas) and the little black (P. sulcirostris) did not escape mention. I suspect, however, that one of the species that causes much frustration, especially in the estuaries of the rivers of the eastern South Island is the spotted shag (Stictocarbo punctatus). This shag is common along some coasts and I suspect that it preys heavily on the populations of Stokell’s smelt (Stokellia anisodon), which abound in Canterbury river estuaries during the spring and summer. It might eat some salmon smolts and young trout, too, though there is no evidence for it. However, the smelt are so hugely abundant that I doubt that the shags would bother with salmon and trout. You can see spotted shags busy in the river estuaries and for the simple-minded, the obvious assumption is that they are eating small trout and salmon. I doubt it, but some evidence would be interesting.

There is no doubt that black shags do eat trout. What is in doubt is that this predation plays any significant role in reducing the numbers of trout and salmon in our rivers and available to anglers.
Fundamentally, the question that needs to be answered is: “Does shag predation result in an overall reduction in trout population size, or is that predation more properly viewed as one of the many factors that contribute to the population balance that we observe in our trout populations?”

In other words, is shag predation doing anything more than “creaming off” the surplus stocks in the trout populations that, if not removed by shag predation, would disappear as a result of some other type of population control? If we look at population tables for trout, it is obvious that most of the trout that hatch from the spawning redds will die from some cause or other before they reach anywhere near takeable size (takeable by anglers, that is). Data from the Horokiwi Stream showed that of total spawning production of around 100,000 fish, only 800 were still alive when the cohort began to be takeable by anglers early in its second year. If most of the young fish are going to die anyway, either from predation or exclusion from habitat as a result of intraspecific competition, starvation, disease or whatever, does the possibility that shags contribute to some of that mortality make any difference to the population in the end – i.e. would most of the trout that shags eat die from some other cause if they were not taken by shags?

So, what does it matter if some of these, or even a lot of them, are taken by shags? Making the assumption that shags do make a difference, on the basis of no quantitative information, is no basis for sound management of either the trout populations or the shag populations. That assumption is no more sound than the assumption that they don't make a difference.

Critics will, no doubt, argue that the Horokiwi data are too old, and don’t apply today – well they are no older than the information in Williams’ book on shags and at least the Horokiwi data were collected in a rigorous and objective way. I presume that Williams’ book was republished because it was considered to provide the evidence needed to “convict” the shag. I’m not so sure. Apart from anything else, Williams stated that he undertook his “research” under the presumption that shags are a menace and that’s not the stuff of science. Reminds me a bit of “creation research”. One insightful critic reckoned that: “Creation scientists know the answer to the question before they begin their study of the question and the purpose of their research is to support the answer, not answer the question!” The shag debate is a bit like that, it seems to me.

Let me finish by drawing what I think is an interesting comparison. The anti-shag campaigners berate scientists for adopting the approach that the more times something is said the truer it becomes. Quite apart from the fact that the critics provide not a skerrick of support for such slander, what are they doing, other than blathering away with the same repetitive invective against shags and, as far as I can see, not a skerrick of reliable support for their own assertions, repeated over and over again a bit like a kid with an automatic rifle. It occurs to me that this is an interesting analogy, in the sense that a kid with an automatic rifle usually misses with most of his shots! Is it, apparently, okay for the trout angler/amateur naturalist to do what the scientist must not do? Seems so to me that the anti-shag crowd think so. Again, I suppose, it is a case of “takes one to know one”, isn’t it?

Where do we go from here?

Getting some up-to-date, rigorously obtained and analysed information on trout populations, mortality rates, and contributors to that mortality (including shags) would not be a bad idea, would it? I suspect that the answer might surprise some of us. I am far from satisfied that Williams’ now dated and always marginally adequate campaign provides the sort of evidence we need to properly understand the place of shags in trout ecology in New Zealand. Apart from any other consideration: Were Williams’ shag data collected randomly to find out what shags really eat, or were they collected by anglers wanting to convict shags of trouticide?

Robert Lord May, President of the Royal Society, London, once Chief Scientist for the British Government and noted ecologist, was recently in New Zealand to present a series of lectures on biodiversity issues. Stimulating stuff, they were. One thing that he said, which stays with me, was that in matters of conservation, we need to derive our motivations “from the heart”, but undertake our “actions from the head”. What did he mean? I think he meant that we should be passionate about things that are
important to us, but then take actions that are based on well-founded facts and logic. It seems to me that this is advice that would be well heeded with regard to shags. In the meantime, shags are basically protected under the Wildlife Act, though a case can be made for control of (only) black shags that may result in granting of permission to undertake a cull. I would not expect it to be easy to get such permission, and that’s as it ought to be. Innocent until proved guilty seems reasonable to me. I’m sure the anti-shag campaigners would agree with that.
2.7 You'd think we had learned

Fish and Game 40, 2003

R M McDowall screams “enough” about the biological hooliganism taking place around New Zealand with the rampant and illegal spread of pest fish.

Things are going on in our streams and rivers that ought to be causing any right-thinking Kiwi interested in our environment grave concern. And I’m not talking about dirty dairying, or trout farming, or poaching, or hatchery stocking, or the parlous state of the salmon fishery. In a way, it’s much more serious and difficult to deal with - it’s a people problem.

But first, let me go back through a bit of history. When the early settlers arrived here 150 years ago, there was a mentality that nothing much here was of intrinsic interest or value, except perhaps as a ‘colonial novelty’. It was believed that New Zealand would only become a civilized place when all the accoutrements of life in Britain had been transported here (except perhaps aristocracy and related attitudes). Some mistakenly expected that the native animals (and people, for that matter) would disappear under the invasive pressures of species from the ‘more advanced’ northern hemisphere and at times it seems a bit like that, doesn’t it? It was perhaps, an interesting and convenient coincidence that New Zealand had climatic conditions not at all that different from Britain, so that many of the animals and plants that were part of life in Britain, and which were so much wanted, could easily become established - if they could be brought here alive. And of course the settlers went at it with an amazing will. Plants were easy, as seeds transport well, but some animals were very difficult. Even so, with some ingenuity, it wasn’t long before there were trout and perch, sparrows and blackbirds, rabbits and red deer, bumble bees and oak trees, and you name it. Sometimes introduced species were a failure, and the best examples from the perspective of the outdoor sportsman were Atlantic salmon and partridges, but it certainly wasn’t from lack of effort that went on well into the last third of the 20th century. But robins and nightingales failed, too, as did bullfrogs and lobsters.

Some of the introductions very soon came back to ‘bite us’. Early on it was rapidly recognised that rabbits were a pest, that sparrows ate grain, and so on, and to compound all the trouble, predators were introduced to destroy the pest species and we had another whole set of pest problems. Today, it is probably the possum that preoccupies us most of all, with regard to its role in transmitting bovine tuberculosis, and in destroying forest canopy trees, and, it seems, attacking eggs and nestlings of some endangered forest birds. Another issue is the status of kiwis and the role of stoats in preventing juvenile survival - predators brought here to control rabbits. And there is fuss about thar and their impacts on alpine vegetation in National Parks and so on. These problems are not going to go away and it seems that we are going to have to live with them.

But you’d bloody well think we’d have learned, and we haven’t. At least some people haven’t.

The presence of catfish in Lake Taupo is the eternal reminder that no habitat is safe from an invasion by alien (unwanted) species when there are thoughtless or stupid people about. Readers may have seen the publicity recently about problems we now have with pest fish. DoC has been running a programme to try and determine where various introduced fish have been distributed and to get a handle on what is happening. But it seems that the fish are spreading faster than DoC can undertake the surveys and new localities are turning up, week after week. Somewhere out there are snivelling sods who are conniving to renew the process of turning New Zealand into a mirror image of Britain and it seems that they are unstoppable. Populations of exotic fish are turning up all over the country. They’ve turned up around Motueka, in Lake Forsyth near Christchurch, in Taylor’s Dam near Blenheim, and in Lake Ototoa on the south head of the Kaipara Harbour - as well as in lots of other small ponds and lakes, which gives you some idea about how widespread the problem is. People are travelling around our country with cans full of rudd, tench, koi carp, and perch and liberating them whenever and wherever they please.

I heard recently of a farmer approached by one of these lowlife miscreants, who told the innocent farmer that rudd were the poor man’s trout and could he release some into the farmer’s pond. The
farmer unknowingly agreed - unknowingly in the sense that he did not know it was against the law, and unknowingly in the sense that he had no idea what the problems might be caused. The pond drains into the Manawatu River, so it doesn't take a brain surgeon to guess what will happen if the pond overflows! It is illegal, it's immoral, it's almost impossible to stop, and I am really fed up! Imagine what we would do if someone started liberating wild cats, or stoats around the country. All hell would break loose and it would be stopped. But sometimes with aquatic habitats it's a case of “under water, under valued“ - it seems that nobody much cares.

We have had populations of perch and tench here for over 120 years. Tench were largely ignored for decades and there were just a few populations around Oamaru until the 1950s when a few were transported to the North Island by the old Marine Department and liberated in one of the two small Otaki “Forest Lakes”. Nobody much cared abut tench, then.

Perch have always been rather more widespread and here and there have been individuals who enjoy fishing for them. But these fish were pretty much ‘well-behaved’ and stayed put. Then in the 1960s and Englishman from South Auckland got it into his thick head that he was going to single-handedly turn New Zealand into a mecca for coarse anglers. And he, like some of these people, is a fanatic. He illegally imported rudd and orfe into New Zealand and it is said that he tried to get pike here. With rudd, he had success and spread them around the country. He was caught, convicted, had his car and trailer confiscated, but it seems that this just egged him on. I'm told he did a recent trip through the country, ending up in Cromwell, so you can imagine how widely he is operating.

The original pernicious activities of this individual, for whom I cannot think of a low enough name, have been overtaken by what seems to be a focussed campaign by other like-minded people, who similarly have no concerns for the New Zealand environment, to get coarse fishing available all over the country. Koi carp were liberated into the Waikato, have reached plague proportions in the Whangamarino Swamp and elsewhere in the lower Waikato wetlands. Rudd, tench, and koi carp are now turning up all over the place and this can only be by the deliberate and illegal actions of people who are placing their own selfish pursuits before the national interest. There is a place for coarse fishing, but there is no place for this sort of anarchy. And if people want to establish populations of these fish for angling, there is a process to seek approval. It is complex, takes time and determination, but is the least that should be done when a new species is being imposed on an existing ecosystem. And the process has been used successfully by some coarse fishing enthusiasts. But there have to be checks and balances to ensure the fish released do not have harmful effects on existing ecosystems.

The thing that really makes me angry is that some of the people responsible for these actions came to New Zealand from Britain because of the absolutely delightful lifestyle we are lucky enough to enjoy here - low population, healthy environment, wonderful scenery, fabulous trout fishing, and a friendly, carefree social environment -and they are now doing their best to recreate the environment that they came here to escape from.

What can I do? To be frank, I don't know. What I'd like to do would probably be regarded as uncivilized. DoC is doing its best to evaluate the extent of the problem, but without the development of public attitudes that frown on such activities, it is hard to achieve anything. DoC, moreover, is badly hamstrung by legislation that inhibits use of chemicals in fish extermination programmes, which is a serious concern (and I’m not talking about 1080). Certainly the Fish & Game Councils have a role. They were quick enough when the Aramoana smelter was proposed and just the mention of trout farming would get the “pitbull out of his kennel and rattling chain”. Otherwise it’s up to YOU and ME to make it clear that this sort of biodiversity anarchy is intolerable. I've called it biological hooliganism before and still think that’s what it is.
2.8 You must be joking

Fish and Game 40, 2003

R M McDowall enters the smallmouth bass debate.

When I read Jack McKenzie’s Issue 47 article, Bass And Our Political Pendulum, about possibly bringing bass here, I kind of groaned. “Not again?” I thought. “When will we learn?” And I suppose I expected to hear the “pitbulls” out, rattling their chains, barking in favour or against, but the early reaction seems quite muted. My guess is that Jack rather firmly had his tongue in his cheek. But it is probably both useful and informative to look at the question, just to remind ourselves of history.

Bass is not a new idea here. In the 1940s, the acclimatisation societies wanted a sports fish for our warmer, northern fresh waters, especially north of Auckland where freshwater sports fish don’t thrive - at least the species already here don’t. So there was a survey of relevant waters and an investigation into what sports fish might suit these waters and might be attractive to anglers. An investigation soon settled on bass, with American smallmouth and largemouth bass given priority, both being premium angling species. Smallmouth bass were soon rejected, being regarded as likely to have adverse impacts on New Zealand trout fisheries (as Jack realises). In those days no one seemed to care much about threats to native fish, which might be under even more threat than trout populations.

So the fisheries bureaucrats recommended to government that largemouth bass should be introduced. In those days (the 1960s), no one had heard about environmental impact assessments and none was undertaken. I was then a new employee of the Fisheries Branch of the Marine Department, where fisheries research and management were undertaken. In mid-1965, on study leave, I went to the United States to do my PhD, and when I got there I had discussions about bass with fisheries people. It became obvious to me that bass, being serious piscivores (fish eaters), would almost unquestionably have adverse impacts on native fish, let alone on trout. Now the more naive of us might think: “Well, we’ll only liberate them where there are no trout.” But that doesn’t work. Recent history clearly shows that fish have a habit of moving around, even though there are no aquatic connections - apart from buckets in the backs of people’s cars. Once bass got here they’d soon spread, despite our best intentions.

And though there weren’t environmental impact assessments in those days, I did one from the safety (out of reach of bureaucrats) of my American University. What I found gave me the horrors. Apart from inevitable potential of bass to spread, it became plain to me that to produce fish of interest to anglers, largemouth bass need a diet of fish (as would smallmouth bass, as Jack agrees). Now, we know that rainbow and brown trout have had adverse impacts on native fish in New Zealand waters (well at least some of us think so). Bass would probably be much worse and they’d do it in places where there have been no trout impacts. I predicted that bass might do quite well until they had eaten down stocks of native fish, probably exterminating them at least locally. “Who cares?” do I hear someone snort. Well I do, but that’s another story. So my guess was that very soon the bass would become food-limited and, with little to eat, they’d become stunted, or someone would suggest that we introduce a forage species for the bass to eat (another likelihood that Jack recognises in his article) - only accentuating impacts on the food web.

So rather nervously, as a very junior Marine Department member of staff, and with the luxury of being on overseas study leave at that, I wrote an evaluation of the situation as I saw it and sent it off for publication in the government’s own New Zealand Journal of Marine and Freshwater Research. It got past all the vetting and critiquing that scientific papers undergo, was published, and, to my surprise and encouragement, at the bottom of the second page was a footnote: “Since this paper went to press the government has declined to authorise the introduction of largemouth bass into the coastal dune lakes of North Auckland (Cabinet decision of 6 May, 1968). And I didn’t get fired after all. Basically, that was the end of that. There’s been occasional mention of bass by some who know little history, but otherwise it was a dead issue - until Jack McKenzie raised the issue.
It might be worthwhile to briefly think about what might be needed if Jack was really serious. Importations of new organisms are controlled by the Hazardous Substances and New Organisms Act and administered by the Environmental Risk Management Authority. So if Jack, or anyone, was serious about bass, they’d have to lodge an application to ERMA. There would have to be a substantial environmental risk assessment (to be undertaken at the expense of the person who lodged the application). The assessment would be submitted to a panel of experts for their evaluation (again at the expense of the application-lodger). Public comment would be called for and, in all probability, a hearing held (again, I imagine, at the expense of the lodger of the application). Do you get my drift? It is becoming an expensive business, so the person(s) would need to be REALLY serious.

I have absolutely no doubt, at all, that there would be masses of submissions, heaps of them against the proposal and probably led by the Fish & Game Councils, which would need to be sure that our trout fisheries would not be under threat - and they probably would be. The Department of Conservation would wheel in its fish experts who, I also have no doubt, would be implacably opposed. Thus, all of a sudden, all the likely expense could in the end be fruitless and once the initial lodger of the application had seen where it was heading, I suspect he’d withdraw before it “cost him an arm and a leg”.

Sorry ... if we want to go bass fishing, it’ll have to be in North America, or in various other countries where bass have been introduced and where they’ve caused damage like I predicted in my initial analysis (and the bass fisheries are nothing to get excited about). The days of easy introductions of new exotic species are over. We’ve learned that introductions of exotic species can be environmentally catastrophic and are largely a thing of the past. That, I suspect, includes bass, and I won’t be holding my breath that a policy change might happen.
2.9 The truth about rotenone

Fish and Game 51, 2006

Some recent commentary about the use of rotenone suggests that there is a bit of a debate looming about its use. Seems to me that, when having a debate, a bit of reliable information certainly helps, as I wrote when commenting on angler’s attitude to shags in Fish & Game New Zealand Issue 38 back in 2002, but some readers seemed to be so agitated that they didn’t really read the article and their responses tell us more about them than about shags! Let’s hope the same thing doesn’t happen when I tread in such sensitive territory with this article. Knowing about rotenone is important at the public level so that we can hold users accountable and can feel reassured that harmful things are not being done to our natural environments and ecosystems.

What questions about rotenone are relevant to the readers of this magazine, to anglers and hunters? Perhaps some of the following:

• Do we really need to be using a chemical like this in the natural environment?
• Is it safe?
• How long has it been around?
• Do we know enough about it to use it without significant risks?
• Does it persist in the environment?
• What evidence is there about its effects?
• Does consumption of it accumulate in the food chain, or even concentrate as some poisons do?
• Is its use a danger to those actually using it?
• Can it be used to target certain organisms and not others?

All of these, and perhaps further questions, are legitimate and worth considering. So, let’s have a look at what is known, or where we can look for more information, if we want to.

Rotenone is a powder made from grinding up the roots of a variety of naturally occurring plants in northern South America and Southeast Asia – plants that belong to the pea family, Leguminosae – that’s right, they are legumes. I hope this doesn’t put readers off eating peas or beans. Its use was discovered hundreds of years ago, by the native peoples where the plants occur. That, of course, does not make it safe, I suppose, but certainly rotenone has a pretty old heritage. These native peoples used it for catching fish, to eat, and again, that brings it all fairly close to ‘home’ – people have used it for ages. Some of the plants that rotenone comes from belong to the genus Derris. That no doubt sounds a bit familiar to home gardeners, who have used derris dust for dealing with white butterfly caterpillars on their cabbages and Brussels sprouts for a century or more. Yes, it’s the same material. Derris dust and rotenone are the same thing! And so we are getting closer and closer to ‘home’ if you like, when there are canisters of derris dust sitting around in the garden sheds of a multitude of home gardeners, who use it on cabbages they are growing for their own, and their families’ dinner, who spill it around their garden sheds and over their hands, perhaps inhaling some of the dust. As far as I know it has not been replaced by an artificially-produced chemical that does much the same thing as the natural product.

At some time during the 19th century it was discovered that biologists could use rotenone to manage fish populations, and it came into widespread usage, especially in North America, where it was used for several purposes. Sometimes people doing fish surveys used it to determine what was living in a creek or pond. I’ve heard of scuba divers pumping it into crevices to catch fish, and it has been used widely in rock pools and other confined places, again to catch the fish that live there. Sometimes it has been employed to eliminate unwanted fish species in a waterway, so that nuisance species could be replaced by useful species. Of course none of this exonerates rotenone from having damaging or harmful impacts – we need to remember that we used DDT until it was found that it was a danger to both ecosystems and human health, and there is no basic reason why the same could not have been demonstrated for rotenone – though to date, at least, it hasn’t. Use in fish biology varies; some
forms of rotenone are suspensions in solvents, because rotenone does not dissolve at all well in water. Use of solvents makes its application easier. But, there have been concerns that the petrochemical solvents are more environmentally damaging than the rotenone itself. As a result, there has been a move away from the commercial products and back to the powder. But I'm not aware that the dangers from petrochemical solvents stop too many people from filling their lawnmowers, cleaning their paintbrushes, or even their hands, with such solvents. So we need to get things a bit in perspective.

There have been suggestions that rotenone is carcinogenic, or that it provokes Parkinson's disease, but all the information available, and there is a lot, suggests that neither of these claims is true, at least when working at the sorts of concentrations and frequency likely in fisheries management. As far as I have been able to determine, there are no serious health risks from the use of the material, except that it is advised that people applying it should wear face masks and other protective gear to prevent them from inhaling the dust when it is being handled. I wonder how many people use face masks when spreading derris dust on their cabbages. I certainly haven't!

How does rotenone work, and what are its risks? Rotenone kills fish by inhibiting some of the physiological processes involved with oxygen transport in the blood – so, I suppose, you could say that it suffocates the fish (if suffocation is a lack of oxygen). Those who know, say that it is much more effective on fish than it is on humans, and other mammals, owing to the different ways that mammals and fish take up oxygen, and especially that the fish get their oxygen from water but mammals from the air. It has varied impacts on various fish, some of which are more vulnerable than others. And it tends to work much better at warmer rather than cooler waters – no doubt because a fish's oxygen demands are greater in warm than in cold water.

Has rotenone been used in New Zealand for fisheries projects? Yes it has. Ichthyologists have used it for fish surveys in coastal rock pools, and, also, it was applied at the end of some trials investigating the value of grass carp in weed control in the early 1980s. Parkinson's Lake, a small landlocked pond just south of Auckland, was in a bad state with extensive growths of aquatic macrophytes (oxygen weed) and a fairly substantial 'brew' of a variety of exotic coarse fish (illegally liberated in the lake). Grass carp were introduced, and over a period of years, they eradicated the stocks of exotic macrophytes, even getting rid of the rhizomes in the substrate of the lake. The grass carp having done their job, it was decided to remove them using rotenone, and at the same time get rid of the various, unwanted exotic fish. Rotenone was spread over the surface of the lake – after some careful calculations of the amount needed to produce a lethal concentration, and a boat and outboard motor were used to increase the mixing of the rotenone with the lake's water. Before long, fish began to emerge at the surface of the pond. No-one had any use for the various exotic species that were present, but it was thought that the grass carp – and they were big ones up to a metre long – might be useful for weed control somewhere else, so as soon as a grass carp appeared at the surface it was netted and hastily placed in some drums of fresh water. From memory (I was there), not one of the grass carp died – so the effects of rotenone were not lethal for the fish provided they were rescued soon enough. Parkinson's Lake was restored to pristine condition and the macrophytes did not return, allowing the native plant flora of the lake to re-emerge. More recently, the Department of Conservation has used rotenone for exterminating pest fish in some small ponds in the Nelson area, again without any known enduring harmful impacts, beyond killing the unwanted fish. You can find informative accounts of the use of rotenone in a DOC publication called 'Managing invasive freshwater fish in New Zealand', a publication that emerged from a workshop/conference on managing invasive fish in New Zealand - look for two papers, one by Lindsay Chadderton, of DOC and another by David Rowe, of NIWA. Chadderton's paper describes use of rotenone by DOC in getting rid of invasive pest fish around Nelson.

One of the ways that rotenone can be used is in a bait for exterminating pest fish. An automatic feeder is located at a water-body of interest, and over a week or more, baits without rotenone are dispersed to get the fish used to the food. That having been done, baits with rotenone in them are substituted. This works, though perhaps not as well as had been hoped, as it seems the fish are cunning enough to know that the rotenone baits taste different – a good idea, though perhaps not as good as the promoters had
hoped. This was attempted with the grass carp population in Lake Waingata, south of Dargaville, with only partial success (David Rowe’s paper discussed this event). You might think that partial success is no better than total failure, but because the grass carp won’t breed in the lake, a substantial reduction in the number of grass carp in the lake was a useful step towards restoration of this lake to its natural state. All the information I’ve been able to find suggests that rotenone breaks down rapidly once exposed to the natural environment, and also that the breakdown products are not regarded as a risk to health. Thus, there is no evidence that wildfowl inhabiting waters where rotenone is used are seriously harmed. However, insects and crustaceans living in the target water are affected, though case studies suggest that recovery is rapid.

Rotenone can be used to eliminate fish from streams, and one might immediately wonder how far downstream it continues to be effective. Control over the effects is exercised by releasing an oxidising agent at the downstream end of the stream being treated. Normally potassium permanganate (Condy’s crystals) is used, and is effective. You need to know how much to release, and that requires some knowledge of flow volumes in the stream and the concentration of rotenone coming down stream. I know of its use in Australia for eliminating a pest fish, and no untoward effects were observed – though there are some concerns that the potassium permanganate might be nearly as harmful as the rotenone on downstream populations.

One of several letters to Fish & Game New Zealand has expressed horror at the prospect of using rotenone to get rid of the exotic fish in the Karori Reservoir, in Wellington, inside the wildlife sanctuary that has been established around the reservoir. He doesn’t like the ‘idea’ and I suppose I could sympathise with him if I knew nothing about rotenone – which I suspect is true of him. He doesn’t exactly say why he doesn’t like it, he just doesn’t. As I understand it, this is not just a random operation to get rid of the trout and perch from Karori Reservoir. There, as with the birds in the bush around the enclosure, it is hoped to see the return of native freshwater fish. I hope your correspondent might get as much pleasure from knowing that there are banded or giant kōkopu in the pond, as he would from knowing that there are perch and trout there.

So, all in all, do we have anything to be concerned about? In my view, as long as people using rotenone take some care with what they are doing, there are unlikely to be any long-term, harmful environmental impacts. I can imagine that some readers will be saying ‘If 1080 and DDT and Dieldrin and ……. are harmful, why not also rotenone?’ That’s a fair enough question that needs to be asked, and answered. All I can say is that as far as we know, rotenone has no lasting damaging effects on natural waterways. As with any poison, we may be wrong, but it does not seem so, given the long-term abundant use of rotenone in derris dust, on home garden cabbages.

Want to learn some more? Have a look at a really useful report by University of Waikato biologist Nicolas Ling, prepared for the Department of Conservation. It’s called “Rotenone – a review of its toxicity and use for fisheries management” and is Science for Conservation No. 211, published in early 2003 – 40 pages of useful information. You can pick it up off the DOC website, just like I did, at no cost. Ling reports that there have been more than 1000 papers published on the use of rotenone since 1990! And he gives us the formula: (2R, 6as, 12as)-1,2,6,6,61,12,12a-hexahydro-s-isopropenyl-8,9-dimethoxychromeno[3,4-b]furo[2,3-h]chromen-6-one. I’ll bet that’s helpful, and hope I got it right! Seriously, Ling reports use of between 25 and 60 tonnes of this substance per year in the United States, on crops, vegetables, domesticated pets, around the house, and on fish. Over 20 tonnes (yes 20 tonnes) was used in one American reservoir, in 1990, alone. Other projects have included use in 400 km of the Russian River in California and 700 km in the Green River, in Utah. I guess this could only happen in the US (or Russia). Any suggestion that the Ling report is unreliable because it was prepared for DOC, is being seriously unfair to Ling (as well as to DOC, in my view).

Some people might take comfort from the fact that rotenone is about as ‘organic’ a product as you can get. That doesn’t reassure me much, as a poison is a poison is a poison. However what we know of rotenone does not cause me great environmental concern. It seems to be one of the more benign of poisons used in biological control (and home gardening).
2.10 What’s up with the Taupo fishery?

Renowned freshwater fisheries scientist R M McDowall offers valued independent thoughts on a research agenda for what many consider to be a Lake Taupo trout fishery in crisis.

In the early 1950s, our family headed for summer holidays to camp at Lake Rotoiti, where my father and I would catch our first trout. On the way home, we camped for a night at Mission Bay and were hugely seduced by Lake Taupo. On getting home, my father made enquiries and found a group of his colleagues from Massey College were camping at Mission Point and we joined them the following summer. And so began a long history of holidaying at Mission Point. To begin with, we hired a dinghy and would row down the river and then to Mission Bay and troll. Before long, my father decided we should have our own dinghy. We began to fish the rips around the lake shore during summer, especially the Tauranga-Taupo and Waitahanui, but fished virtually all the small streams around the lake - Kurutau, Waimarino, Hatepe, Pukawa, and others, mostly at night.

One day, in mid-January around 1954, my Dad said: “Let’s look in on the Tongariro on our way home.” We found our way into the old Hut Pool behind a nascent Turangi and I can still see a red-sided rainbow that I hooked, but lost that day on a little split cane Sealey “Rainbow” rod. That was the first of many encounters with the Tongariro and we began as a family – my parents, brother, and me – to fish the river in autumn and winter. Over the years, our family would return to Taupo every summer and be there for shorter trips several times a winter. For many years, I would gut all the fish we caught and record their diets - I guess the very beginnings of my career in fisheries science. The river and lake have been a very special part of my life.

Lake Taupo and its rivers have a history of their own. The lake was formed in its present state by a huge eruption nearly 2000 years ago - the largest volcanic eruption in human history. The lake is basically a huge collapsed caldera and the eruption of which I write was just the last of many over 50,000 years or more.

Of course, after the last major eruption, nothing could have survived in the lake and the animals now found there must have arrived after the water conditions improved, and it probably took many years. How the fish got there is uncertain, but Māori legend tells of a man named Ngatororirangi, who introduced fish into the lake. This may well be what happened and the same may be true of the koura or freshwater crayfish (Paranephrops planifrons) and kakahi or freshwater mussels (Hyridella menziesii) that now live there.

Not a great deal is recorded about the importance of these species to Māori communities living around the lake and much of the detail is erroneous but, clearly, substantial populations of Māori lived around the lake shores and fish from the lake were a major food source. The abundance of the juveniles of the kōaro in the lake (called inanga by local Māori ) was prodigious. Early colonial history relates how Māori caught ‘inanga’ by the ‘hundredweight’ using large seine nets.

Several accounts tell how, after heavy storms, Māori could walk around the lake shores and pick up adult kōaro (that they called ‘kōkopu’) swept ashore by the waves to the extent that it was a significant source of food. On our first experience camping at Mission Bay over a century later, we collected koura washed ashore in what must have been much the same way.

And so we come to the trout introduced into Lake Taupo. First, it was brown trout in the late 1800s and these flourished and grew in huge abundance. Then rainbow trout were introduced a little later and they, too, flourished and grew in a way that caused amazement and phenomenal angling ensued. Why did the trout do so well? There was a series of contributors:

1. the quality of the water was near perfect – pure, clear, cold – even in summer
2. there were almost endless gravels in lake tributaries in which trout could spawn
3. the food supply in the lake was prolific - fish that enabled Māori to live around the lake were the energy that initially drove the fishery, which became internationally famous.

After trout were introduced, there was rapid collapse of the kōaro populations. Once trout were established, the native fish were no longer available as formerly, causing major problems for Māori communities around the lake. I have little doubt that it was availability of these fish that enabled Māori to live there. Within a few decades, trout predation had destroyed the kōaro populations and condition of the trout deteriorated seriously. In response to this, the government introduced smelt and to an extent this saved the trout stocks. Smelt soon provided the ‘engine’ that drove the modern trout fishery. But even with smelt present, there were times when condition of the trout deteriorated very seriously. During the 1950s or early 1960s, there was no trout bag limit. Anglers could catch as many as they liked and there are stories of heaps of slabby, dead trout lying around rivermouths that weren’t worth taking home. This did not persist for long and for many years there was a bag limit of 10. In a way, this is little different from no bag limit, as relatively few people would actually reach that limit and the number might end up as more of a number to be achieved than as a measure to limit catch. The limit bag of 10 might have resulted in more fish being taken, not less. However, at times it was easily possible to reach 10 and I recall one night returning from the delta with 26 taken by three of us, and wondering what we were going to do with all these fish!

Now, it seems, the Taupo trout fishery might be in crisis, with talk of serious dissatisfaction with fishing this season. DoC fisheries managers have reduced the minimum size for fish taken because too few are being caught around Christmas that exceeded the previous minimum size. You might say to do that is crazy - why allow anglers to catch even smaller fish, if so few of them are reaching the previous minimum size? Wouldn’t you think that the size should even be increased to ensure that enough fish are surviving through to maturity to increase spawning production? I suspect we are seeing something of a conflict of interests between ecological health of the fishery and its financial health - the need to obtain revenue from licence sales to fund management. But, in the end, if you are going to harvest fish, it really doesn’t matter how big they are: if they’re dead, they’re dead.

So what is going on and how can we manage our way through this apparent crisis and see restoration of the fishery we’d like? I have no magic bullet that will suddenly solve it all. We need to look broadly across the lake’s ecology and identify where in the population cycle things might be going wrong, and identify some potential bottlenecks that might become the target for research and management.

In order to get to grips with what goes on in a fish population, like trout in Taupo and its tributaries, we need to recognise the presence of several biological/environmental cycles. These emerge in informal ways in nearly all of what is written about the fishery, though this may not always be precisely stated. One of these is the lifecycle of the trout themselves and we are all aware of at least the basic elements, such as spawning, feeding, migrating, and so on. A second cycle is changes in the lake itself, probably an outcome of seasonal shifts and the lake’s response to these. A third involves micro-organisms in the lake, in essence phytoplankton production that fuels zooplankton, the small crustaceans that drive seasonal production of smelt (formerly kōaro) populations in the lake, the primary food of the trout. From my reading of Target Taupo, it has seemed that DoC managers of the fishery have struggled to both predict looming seasons, year after year, and to explain what has happened afterwards. This is really quite difficult. Also, I think it is difficult to manage a fishery that is exploited as heavily as the Taupo fishery - a bit like keeping a Ferrari racing car tuned.

I understand there are some serious concerns among anglers that even the smallest maiden fish in the lake are in poor condition and that anglers are finding little or no food in their stomachs. If this is so, then there are some serious concerns about smelt production, about which there is no published information. But DoC carries out seasonal surveys of smelt stocks and should have some kind of a handle on what is going on.

In managing a fish population at a stable level, all that is needed is that each spawning pair must on average, produce only enough progeny to allow another pair of fish to spawn successfully. Of course,
the range of actual number of recruits varies widely, with many not producing any recruits at all, as they are harvested before spawning. But this should not matter. So let’s look in a bit of detail at the cycle and begin with:

1. **Eggs are buried in a redd in the spawning streams and are there for several weeks.** All they need is plenty of clear, cold, well-oxygenated water, and there is generally plenty of that. A trout produces about 1500 eggs/kg of weight and about half the population is male. DoC’s publication Target Taupo states that in the 1998 run into the Waipa Stream they counted about 2000 fish, and so 1000 female through the trap. If we assume an average weight of 1.5kg (probably a bit low), then egg production was a minimum of around 2.5 million. However, the trap count did not include fish that got past the trap in floods and so egg production may have been much higher, perhaps 4 million. The 2004 run was perhaps 8500 fish, giving egg production of around 9.5 million. Typically, egg survival is good, though there can be adverse impacts from floods, but these have always happened and, of course, we are looking at only one spawning stream. Whatever way we look at this and however you tweak these numbers, there are a lot of eggs and plenty to support the fishery. Clearly, DoC had some concerns when it reduced the bag limit from 10 to eight, and most recently three, but whether this was needed is arguable. There seem to have been plenty of fish spawning and maybe, if nothing else, reducing the bag limit primarily meant that catch was shared among more fishermen.

2. **The alevins hatch and spend a few weeks buried in the gravel.** This is probably a tactic that results in bigger fish emerging from the redds and may increase survival, making them better swimmers. My hunch is that survival to ‘swim up’ is probably usually good, though again there can be catastrophic floods.

3. **The alevins swim up into the river and begin life as fry/juveniles.** At times, in spring there can be huge numbers of small fry around and my hunch is that this is a time of major mortality.

4. **Juvenile life in the rivers and lake.** This seems to be a stage about which relatively little is known in Lake Taupo and its tributaries. Some stay in the streams and rivers, but many move down into the lake at very small size. DoC information suggests fish have to be over 90mm at emigration into the lake to have a good chance of survival. However, and this is important, if huge numbers of very small fish move down to the lake, it requires only a very small proportion to survive to make a major contribution to the adult population. Certainly, at times, small post-fry rainbows can be common around the lake shores. Massive early migration into the lake is probably a result of competition for space and food. However, if juvenile rearing in the rivers is a key element in trout production, the amount of quality space in the rivers is a key issue. I have memories of what were clearly small rainbows “blipping” at the surface around the lake shores in summer. I also recall one day in February catching 13 fish in the Birch Pool in a couple of hours, mostly 25-30cm, well undersize; obviously some important rearing happens in the rivers. My angling experience is that very few fish of this size were taken in the lake, but it is unclear whether that was because they weren’t there, or because they were inaccessible to anglers. I think this is an important area that needs research. What is the optimum size for emigration to the lake? This is not just a question of the proportion that reaches the fishery, but also of absolute numbers and these are very different figures. Which fish survive and why? This is a difficult question to study, but studies of daily growth rings in the otoliths might be informative to identify where growth happens.

5. **Feeding and growth in the lake.** This is a critical phase, as it is when fish are taken by anglers. There is a wide assumption that growth is driven by smelt, and I don’t doubt that. It seems to me that dependency of trout on smelt is a serious matter and isn’t easily manipulated. Target Taupo, suggests “scientific studies have shown that there is far more juvenile smelt production than there is zooplankton to support them”. If that is so, then I wonder how the smelt grow? Regardless of that issue, this seems pivotal and I wonder whether enough is known about smelt ecology, given its importance. In the past, there have sometimes been other important foods, like green beetles, that were once important in summer and disappeared perhaps as a result of use of DDT superphosphate fertilisers, which came back when DDT was banned, but seem to have disappeared again. Frogs were important one year when
the lake was very full for a long time. I heard concerns about planting pines around the lake, but know nothing quantitative and, of course, now pines are being removed and dairy farming is intruding. If it’s not one thing, it’s another. I would be interested in some figures on the proportion of trout taken from the lake, as opposed to from the rivers, and how this might affect recruitment. Has jigging placed an unsustainable burden on the fishery? Some are blaming shags, though one wise soul argued that shag abundance may indicate just how abundant the trout are. But, as I stated earlier, it seems that enough eggs are being deposited to support the fishery.

6. Adult fish mature and return to the rivers to spawn. A significant element here is that there is probably very strong homing by fish back to the stream where they themselves hatched. If true, then we are not managing one Taupo population, but a number. DoC research suggests that fish move widely around the lake, so the populations become mixed, but segregate when returning to spawn. This makes it hard to manage exploitation in the lake based on numbers spawning in the tributaries.

One unmistakeable point is that seasonality of spawning has changed over the decades. I recall, as a lad in the 50s, going up the Waimarino in May and the pools were black with fish - almost uncatchable and scarcely worth catching owing to their declining condition. But there were heaps. And I have memories of rainbows spawning in the back channel of the Island Pool in May. Do they still do that? Target Taupo reported over recent years that rainbow spawning runs in the Tongariro have been getting later and later, some fish spawning even in November. Issue 50 tells that by 2006, nearly 70% of fish ran after September 1; and more fish ran in November-December than in June-August.

I can’t remember when the open fishing season in winter was introduced, but I think in the late 1950s or 1960s. What I can remember is that it became increasingly difficult to get good fishing in the Tongariro in May and early June through the 1970s. Maybe I wasn’t there on the right days, but it was certainly tough at times. Most recently, of course, flows in the river are much lower, making the river easier to wade. That, and the advent of nymphing may have increased the ease of fishing. With increasing numbers of anglers, I don’t doubt that harvest has been intense. I therefore ask: have reduced flows and nymphing, plus the open winter season, had adverse effects on the populations? We have to continually remind ourselves, though, that it seems that enough fish are spawning to generate sufficient eggs to maintain recruitment, though clearly the timing has changed. Timing of spawning is almost certainly an inherited trait and, if we are going to consistently heavily select early spawners, then later and later spawning is inevitable.

Interestingly, Target Taupo states that anglers reduce activity in late winter and spring and perhaps that’s part of our fishing culture. Or perhaps they are catching too many spent and poor conditioned fish to bother. And it’s just as well, or maybe no fish would get through to spawn. But here we are, back to the beginning of the cycle where I started, with fish in the spawning streams.

One of the implications of later spawning is that fish haven’t reached takeable size in the summer when they would be expected to contribute to summer trolling. That may, at least partly, be because they have not had long enough to grow, owing to later spawning. As I stated earlier, it really doesn’t matter how big a fish is when you kill it, it is not going to spawn regardless and, on this basis, DoC cut the minimum size from 45cm to 40cm. I had a look back at our family’s catch diary for the 1956-57 summer when we took nearly 100 fish in three weeks. We would have had to return only three fish below 45cm, so much has changed in 50 years.

Target Taupo states: “As the autumn running fish support the fishery throughout the winter, the fishing pressure could potentially affect the size of this autumn run. However, this is unlikely ... Even if fishing pressure in winter was responsible for the decrease in numbers of early running fish, it still wouldn’t explain why the spring run is getting larger.” My response to this is: how could anything else be possible? As I have said, timing of spawning almost certainly has an inherited component and, if angler harvest is selecting (killing) all or most earlier running fish, then a shift to a later spawning season is inevitable. Angler harvest may be the primary driver of the later run.

So, where to from here? If I was managing the Taupo trout populations, I would focus on several aspects.
1. I’d take a careful look at juvenile rainbow trout ecology in the lake and its rivers, as this is pivotal to trout production. I would include some studies of daily growth rings in the fish otoliths, as this might highlight where best juvenile survival and growth take place.

2. I would seek a better understanding of smelt ecology, as the engine that drives the fishery; there seem to be some issues that relate to trout growth, condition, and diet in the lake.

3. I think it would be useful to do some trout population modelling as this might help to highlight where the populations are vulnerable to decline, including the effects of heavy winter harvest on spawning season.

4. It might be interesting to see what would happen to the fishery if a winter closure was re-instituted. I recognise that there are some serious economic implications from doing so, but I suspect that there is really “Hobson’s choice”.

Footnote: This story is based on a lecture late 2008 given by Bob McDowall to Advocates of the Tongariro River in Turangi.
3 Biographies

Bob was an avid reader of human history. In this section he profiles the exploits and achievements of some earlier fishery and game managers, as well as introducing us to Mr Explorer Douglas (a favourite character of Bob’s), and Aldo Leopold, an influential American conservationist.

Bob marvelled at the privations and conditions that early explorers had to put up with, so much so that he had almost completed a book on their diet. He could quote verbatim sections from the diaries of Charlie Douglas, who spent 40 years exploring and surveying South Westland. Bob often mused about the way that Thomas Brunner and companions survived their epic trip down the Buller River and back (550 days), living largely off the land. However, he also admired the determination and foresight of many of the early fish and game rangers – Derisely Hobbs, who realised that hatcheries were largely unnecessary and preached this unpopular theme throughout New Zealand; Leonard Tripp, an early conservationist who recognised the need for research and advocated scientific management; Lake Falconer Ayson, the first Inspector of Fisheries whose main claim to fame was the introduction of Chinook and sockeye salmon to New Zealand together with whitefish and a range of marine species which weren’t successful.

Bob returns to the theme of importing exotic species via Thomas Dunne, who imported a vast assortment of game animals and also lake trout. Edgar Stead was responsible for spreading of mallard ducks (he opposed the introduction of beavers!) – but he strongly advocated protection of native birds, a man ahead of his time. Cecil Whitney, too, was associated with mallard ducks and also the stocking of rainbow trout in Lake Taupo – he seems to have had an obsession with Taupo and advocated hatcheries to produce koura and whitebait as food for trout in the lake! Bob also acknowledges the contribution of Gerald Stokell, the first person to study New Zealand’s native fish. Tom Andrews is less well known; he was an acclimatisation society ranger whom Bob credits with fostering his own interest in conservation.

The essay on Aldo Leopold is a departure from New Zealanders, and is a ‘must read’. Leopold was one of the first conservationists to recognise the importance of focusing on habitats rather than the species; he also recognised the importance of predators in maintaining ecological balance and biological diversity, and strongly advocated restoration of native flora and fauna. Bob suggests that Leopold’s message is even more relevant today than it was 60 years ago. This essay finishes with the poignant words: “We owe him nothing except gratitude for his writings, but we owe it to ourselves and our descendants to leave New Zealand a good place to live. I think that legacy is at risk”.
3.1 Derisely Hobbs – the man and his message

Fish and Game 33, 2001

R M McDowall implores each and every angler or fisheries manager of today, who genuinely seeks to understand the rudiments of our freshwater fisheries, to take time out and learn a bit about the self-effacing man whose work last century in the area of salmonid fisheries research and management was “so revolutionary and innovative” that it still has vital implications today.

I've just been reading the very first column on fishing in the Christchurch area by a writer making a new contribution to a city newspaper. He had been fishing in the Selwyn and hadn't done any good. His response was to write: “Perhaps it is time the Fish & Game Council considered restocking this lovely river”.

Oh-my-gosh ... it just made me groan. When will people learn to ask the fundamental question – “Why are there no trout there?” – before they assume that rearing some in a hatchery and putting them in the river will make a difference? Had he never read anything about trout populations and their reproduction in our river systems? Did he know nothing about the summer flows in the river? Had he never heard of pollution and eutrophication in Lake Ellesmere, into which the Selwyn River flows? Evidently not. Presumably he hadn't read the article I wrote on the Selwyn River in Issue 26 of Fish & Game New Zealand that talks about these things and explores questions relating to the decline in the Selwyn's once phenomenal trout populations. And I'm sure he had never read any of Derisley Hobbs' writing. Probably he'd never even heard of Hobbs, and more's the pity.

It got me to thinking. I've mentioned Hobbs in a number of articles over the years and I began to wonder: “How many of our numerous angling bibliophiles (book collectors - and there are heaps of anglers who collect books) have copies of Hobbs' New Zealand trout reports among their collections?” And of those who have: “How many have read them?”

Taking this just one step further: “How many of those who have read these reports have tried to understand what Hobbs was saying and to use his ideas to understand our trout fisheries?” Precious few, I reckon. The actor in the famous Toyota advertisement would probably say: “Bugger all”. And he'd be right.

Well, why all this fuss and talk about Hobbs? Who was he and why does what he says matter? And is it relevant today?

Derisley Hobbs lived in Christchurch. I am unsure about what he initially did for a living, but it seems that he may have been a law clerk, or some such. In the present context, it really matters little. What does matter is that he was a keen angler and became involved in the North Canterbury Acclimatisation Society. Specifically, during the late 1920s he was a member and eventually chairman of that Society’s Research Committee. That committee was a forerunner of the Research Committee of the New Zealand Acclimatisation Societies, which emerged during the early 1930s. If you read my “Gamekeepers for the Nation” (a history of New Zealand’s Acclimatisation Societies), you will find this national committee actually formed the basis for the beginnings of all freshwater fisheries research on salmonids in New Zealand. So it had quite a history and Hobbs was a key element in it.

Hobbs became so interested in the work of the Research Committee that he soon abandoned his employment and became a fulltime research worker on our salmonid fisheries - employed by the National Research Committee. There is absolutely nothing to show that Hobbs was equipped with any special training that would fit him for such a position, but this lack of training is certainly not evident in the outcomes of his research. Perhaps it was his lack of indoctrination by professional biologists that gave him a distinctly fresh approach to salmonid fisheries management – an approach that was so incisive and relevant that his work is still widely quoted, and followed, 50-60 years later. What he discovered was quite revolutionary.

Hobbs set to with a will and enthusiasm to survey New Zealand’s trout fisheries and to try to determine what it was that controlled trout abundance and growth rates, and produced three substantial reports.
The last of these was the most pivotal, entitled: “Trout Fisheries in New Zealand: their development and management”, and it was published in 1948 as New Zealand Marine Department Fisheries Bulletin Number 9 (175 pages long). I personally believe that this bulletin should be compulsory reading for every Fish & Game councillor in the country. Sadly, I doubt that many have even heard of it, or of Hobbs. What did Hobbs find that was so revolutionary and innovative? One of the things he did was to try to estimate the number of eggs deposited by trout in the redds of the spawning streams in representative rivers throughout the country and then to determine the percentage of those eggs that hatched and resulted in young trout moving downstream to populate our rivers. What he found was a revelation to him – and to everyone else. The numbers were highly astonishing – astonishingly high, that is. Then Hobbs began to compare the number of eggs with the number of fish that acclimatisation societies all over the country were liberating into these same rivers, and at considerable cost. Hobbs immediately saw that the numbers being released by the societies were so small (compared with natural production) that they were scarcely relevant to the trout population economies of the rivers – the releases made almost no difference at all. So, if that was true, then Hobbs reasoned that the cost and effort of making the releases was a total waste. It is important to realise the context in which these findings took place. During the first half of the 20th century, everyone was well aware that the only reason there were trout in our rivers and lakes was because the acclimatisation societies had introduced the fish from Britain and North America and had liberated them there. It was only a small leap of faith from that knowledge to “knowing” that the only way the populations could be sustained was by continuing those liberations. To make continued liberations possible, the acclimatisation societies built hatcheries all over the country and were spending large proportions of their budgets raising and releasing trout – tens (?), no, hundreds of thousands of them (well, millions, actually). “The hatchery” was the “pride and joy” of many societies, a symbol of their success and a sign of their investment in our trout fisheries. And then, as if to spoil it all, Hobbs came along and essentially said: “Well, really, if you don’t mind my saying so, the hatcheries are actually in many cases a waste of money and the releases are not making any difference at all.”

Acclimatisation society councillors and members of the day were just not in a frame of mind to accept such revolutionary ideas. All their “experience” was contrary to this notion and, anyway, “What did Hobbs know?”

But Derisley Hobbs really believed in what he had found and was not one to give up easily. And so, during the 1940s and 1950s, he travelled the country, talking to public meetings convened by the acclimatisation societies and telling anglers about his findings. I never met him, but can recall as a small boy being taken to one such meeting in Palmerston North by an uncle who taught me trout fishing in the rivers nearby.

I guess I was too young, as it all “went over my head”. Unfortunately, it also seems to have all “gone over the heads” of the anglers and acclimatisation society councillors of the day. You can read the response of the Wellington Acclimatisation Society to Hobbs’ suggestion, that hatchery releases were mostly wasteful, in that Society’s Annual Report for 1944: “How utterly wrong this is, is proved by the closing of our Hatchery in Masterton. In the minds of many anglers, the reduction of the fish populations is very largely due to the cessation of stocking”.

What was this statement based on? Nothing but the perceptions, opinions, and preconceived notions of anglers. There was not even any objective information to show that fish numbers were down, quite apart from the fact that, if Hobbs was correct, there was greatly more juvenile trout production going than the rivers needed. Hobbs got a similar response in Dunedin. The Otago Acclimatisation Society’s annual report for 1941 includes: “Though much of what he said was interesting, many of the members felt that, even allowing for the accuracy of his premises, the deductions he drew from them were by no means logical or warranted. Quite apart from the dubious value of data drawn from one stream in a particular district, certain of his facts were at variance with observations made in other localities, and at best did not adequately support his theories”.

What did that mean? Basically that they didn’t believe him, and anyway, their rivers were “different”! Hobbs must have been really discouraged that, after all his work, anglers were just seemingly blind
to the fact that our trout fisheries have a staggering ability to produce young to populate our rivers. Perhaps the greatest irony was that the research that Hobbs had been doing, and upon which his ideas were based, was actually funded by a levy on angler licences. The anglers and acclimatisation societies were basically rejecting the research that they had paid for because it did not agree with what they thought.

Recall my article on the Selwyn River, near Christchurch (where this article began, with some angler/columnist saying releases are needed there) – where I calculated that up to 95 million ova a year were being deposited in the river’s gravels and that the North Canterbury Acclimatisation Society was still making fry liberations there. The records of the Otago Acclimatisation Society show that over the period 1869 to 1923, it liberated 23 million (yes million) trout fry and fingerlings into the waters of its district. Three million of these went into the Pomahaka River, then one of the most productive rivers in the area. In the period from the 1920s to 1940s, Hawke's Bay sometimes liberated 700,000 in a single year, and totalled over nine million in the period 1926-1961. I wonder what Hobbs thought? Well, actually, I don't wonder; I think I know!

At one stage the Southern Lakes Conservancy boasted that it had released nearly three million fish into its district in one year, and asserted that: “This excellent result will undoubtedly be reflected in an improved stock of fish ...”

Well, did it? They really hadn’t a clue. They had no data, at all.

Auckland similarly said in 1932 that stocking: “which has been carried out for some time past has contributed largely to the improvement of the fishing”.

That, was sheer supposition. It had not a skerrick of information to support such assertions. No tagging and release survival estimates, no population analyses, nothing. But they “felt good” that the number of fish in the river had been increased by stocking (well, they must have, mustn’t they?). There were not any objective data that the fishing had improved. If the fishery had improved, any relationship to the stocking programme was just guesswork.

I imagine that Hobbs must have despaired at the response of his New Zealand anglers. Strangely, people overseas recognised the truth in what he had found and written and had realised that:

1. before stocking is undertaken it is absolutely crucial that there be information on what is limiting the trout populations
2. equally important is to know how many young trout are being produced in the system by natural reproduction
3. any stocking must be carefully designed to overcome whatever it is that is limiting production.

The problem was that these questions are much simpler to ask than they are to answer. And the acclimatisation societies of the day seem to have found it both easier, and more comforting, to know that there were fish feeding and growing eagerly in the hatcheries and that one day they would be released into the rivers and lakes to grow large and fat for anglers to catch. You will find in the literature and photographic archives around the country lots of photos of anglers, often councillors, actually making the releases, often with a very satisfied look on their faces (a bit like a cat that has just eaten a goldfish, if you will forgive the comparison). How, they thought, could nature do any better?

It seems, from the statement that I quoted at the beginning of this article, by our new Christchurch angling columnist, that some anglers still know no better. What is the solution? I do not know. Up in Hawke’s Bay there is a group of passionate anglers who are convinced that the wrong pH is leading to a decline in the trout fisheries there, and they want hatchery releases to deal with that. Why this should make any difference, I have not the faintest idea and as far as I can tell, they haven’t either. I think most people want hatchery releases just because it makes them feel better. If they can afford it, fine, but please don’t spend my licence dollars on such frivolity. I’ll go for habitat protection every time.

Let me finish by returning to Derisley Hobbs, the subject of this essay. What happened to him? It is rather a sad story, really. Around 1937, the New Zealand Acclimatisation Societies Association found that it could no longer handle the demands of trout research and asked the government to take over. When
that happened, Hobbs became employed by the old Marine Department (where fisheries research was
done until 1972, and incidentally where I was first employed to work on whitebait). In the late 1950s, I
think, a ship foundered somewhere on the New Zealand coast as a result of a lighthouse being out of
operation (the Marine Department also controlled the operation of lighthouses, as well as boilers lift
and cranes ... ). On the weekend that this event took place, it is my understanding that by some strange
and sad chance, Hobbs was the most senior member of the Department “on duty”, and was, in essence,
responsible for the lighthouse being non-functional. How such an event could be sheeted home to a
fisheries biologist is hard to imagine. But Hobbs apparently had to accept responsibility, resigned, and
went to Tasmania (where he took up a position in fisheries research and management similar to the one
he had had so hastily to vacate in New Zealand). Our loss was their gain. Hobbs stayed there until he
died in 1961.

What have we learned in the succeeding 40 odd years? Sometimes, it seems to me, nothing? Some
will argue that things are different now, as conditions in our rivers have deteriorated since Hobbs’ time
and that the need for stocking is greater now than it was then. In general, I would dispute that. Why?
Because most of the deterioration in our rivers has probably been in the lower reaches, where trout
rearing and growth take place. Upstream, in the headwaters where trout spawning, egg development,
and emergence occur, it is probable that there has been relatively little habitat deterioration. It is
the downstream waters – like our Christchurch newspaper columnists’ beloved Selwyn – where the
problems lie. There are no longer suitable conditions in some of our rivers, like the Selwyn, for trout
growth and rearing to take place. Tipping fish into these conditions is just putting more fish into
conditions where even the robust, wild, naturally-spawned fish can’t do well. Not surprisingly, hatchery
fish will do even worse. Think about it – please!
3.2 Ever been trout fishing by steamer?

_R M McDowall profiles Canterbury lawyer and angler William H. Spackman, author of New Zealand’s first-ever trout fishing book._

Many years ago when trawling among the rubble in a second hand bookshop I found a slim, blue book called “Trout fishing in New Zealand, where to go and how to catch them”. More interested then in books on fish rather than fishing, I prowled through the volume and found interesting titbits relating to how trout preyed on smelt and whitebait in river estuaries and, at 7s/6d, I thought it worth buying. As it turns out, nothing else that I ever bought has proved such a good investment. I’ve seen references to it for sale at US$250!

What I didn’t know then (and clearly nor did the bookshop owner) is that it happens to be the first book published here about trout fishing. It was commissioned by the government to provide visitors with a handy guide to trout angling in New Zealand. Published in 1892, it was written by W.H. Spackman, printed by the government printer, and runs to just 99 pages. Even then, the government recognised the value of trout fishing as an asset to tourism (sometimes they seem to have forgotten this).

The guidebook was a useful way to capitalize on the opportunity – for anglers to come fishing and for the government to relieve them of their foreign currency. Obviously, today, from the price people seem willing to pay for Spackman’s book, it has become a collector’s piece, the price driven up by demand from ever-increasing numbers of anglers who enjoy collecting classic angling books. Spackman is a “must” for the serious collector.

Were it not for his book, Spackman’s name would probably never be mentioned by trout anglers. Who was he? Spackman arrived here from England around 1880. He lived the rest of his life in Christchurch and became known in the city as a lawyer, presumably coming here already trained in legal matters. He was a civic leader of sorts, involved with Canterbury University College and the City Library. He became an avid trout fisherman, was for some years on the Council of the North Canterbury Acclimatisation Society, and eventually became president. Towards the end of his life, he was bedridden by rheumatism, which eventually took his life towards the end of 1896. The tedium of his bedridden last year or two was relieved, somewhat, by his winning a Melbourne Cup sweepstake, which netted him a cool £13,000! Remember, this was in 1895, or thereabouts (how many houses would that have purchased, then?). An obituary mentions that at his death his wife and son were returning to New Zealand by ship and wouldn’t you, with a sum like that awaiting you?

None of this really makes Spackman anyone of great note among colonial anglers, but it seemed to me that there is much of interest to the history of angling in his little book – not so much for the plentiful detail about the history of trout introductions, which has been told and retold over the years. Nor does interest lie in his detailed instructions about “where to go and how to catch them”, as the book’s subtitle states. Rather, there is interest here about the finer details of angling, gear, and other accoutrements associated with an “English gentleman” wanting to catch trout in New Zealand.

Let me begin, though, with one statement that cuts at the heart of my life-long interest in New Zealand’s native freshwater fish. On the first page, referring primarily to east coast South Island rivers, Spackman intones: “Twenty five years ago not one of these rivers had the least interest for the angler; ... the rod of the fisherman never cast a shadow on their waters; every one of these mighty rivers, every one of the thousand creeks and streams that flow into them ... were tenantless and profitless to the sportsman”.

A pretty gloomy prospect for the colonial angler, it seems, but a ripe opportunity to make amends. Despite these comments, however, some anglers had found that the native grayling provided fine sport and were good eating and Spackman admitted later in his book that they provided “capital sport and make an excellent table-fish”.
Travellers and explorers often depended, too, on eels for food and the colonists had discovered the abundance and delicate flavour of whitebait. So, things were not quite as bad as Spackman stated, though perhaps to an English gentleman, none of these compared with the taking of a "trout with fly" and, as we all well know, the colonists soon remedied the apparent shortcomings of our rivers. As Spackman enthused: "What a change there is today!" And so there was, and he wrote of "trout of such size that they were looked upon as fabulous [i.e. the stuff of fables], and received [in England] with derision and incredulity ... The history of the acclimatisation of trout in New Zealand is the history of an astounding success." There's no debate about that from an angler's viewpoint.

Spackman's little volume provides visiting anglers with all the information he could gather and of particular interest to present day anglers will be his dissertation on access. He notes that trout fishing is "practically free" (apart from buying a licence) and this must be understood in the context of an Englishman used to having to pay for access to good water. He notes, perhaps with surprise, that: "river beds belong to the Crown ... For some of the smaller rain-rivers leave [permission] is necessary, but it is seldom, if ever, refused. In addition to the riverbed proper, a reserve a chain wide has been made all along the banks of many rivers, on both sides".

So, here, over a century ago, we see the treasured free access to rivers, now thwarted by some landowners (and Health and Safety legislation), under serious threat, and hotly debated.

Spackman provided advice on fishing gear, thinking the "Common English fly-rods ... of very little use; they were never made to hold New Zealand trout", and he reported that "Messrs Hardy Brothers, of Alnwick, make a special New Zealand rod" (he must have had a quid or two, even before he won the Melbourne Cup sweepstake). Actually, many of the Hardy split cane rods used so widely in New Zealand up to the advent of glass and carbon fibre rods, were salmon rather than trout rods, well reflecting the difference between trout fishing here and in Britain.

Spackman recommended a rod 12 feet long – or even 14–15ft in the bigger rivers. He was no fly purist, clearly did plenty of spinning, and ranked baitfishing the most productive. He has extended advice about fishing with cicadas and creepers and extolled the virtues of huhu grubs, bullies, smelt, and inanga. Spackman recommended waders, noting that "being wet all day ... means certain rheumatism sooner or later" – recall that this malady eventually ended his life.

Perhaps the most fascinating aspect is to view what "going fishing" meant for Spackman, compared with today. We're used to hopping in the 4WD and heading down to a favoured spot, often on a few hours', or even minutes' notice, when we know the river is in good condition, the weather congenial, or the lawns need mowing. But for Spackman going fishing was a much more deliberate and planned affair. He talks of places accessible by rail, of the hotels near good fishing rivers and of the rivers available within a few miles’ walk of the hotel. How many anglers, today, I wonder, go fishing by train, stay in a hotel, and walk to the river? Most, I imagine, would rather "rough it" in a tent (as it seems Spackman sometimes did – or at least recommended). But then again, how many would contemplate getting to the river by walking several miles? We'd crash down tracks to the riverbank in the trusty 4WD and maybe do all our walking along the riverbanks searching for fish. To cap it all, Spackman helpfully advises on getting to the Takaka and Aorere rivers in Golden Bay, by "several small steamers [that] run there during the week". Ever been trout fishing by steamer? Doesn't it sound a wonderfully relaxed, gentlemanly affair, and you do have to wonder how much of what Spackman relates had meaning for the ordinary “hoipoloi” of colonial New Zealand in the late 1800s.

I can't resist repeating one of Spackman's better yarns. A poacher was spearing trout at Lake Heron – rather remote now, imagine what it was like getting there in 1887. According to Spackman, this miscreant speared “112 fish, weighing over 7cwt [around 350 kg] ... and finding the fish would not keep, he salted them down in barrels. Either the hot weather was too much for them, or his method of curing insufficient, and they all went bad. To utilize them, however, with true colonial thriftiness, he gave them to his pigs, with the totally unexpected result of killing every pig – a thoroughly deserved reward for poachers and spearers".
We’ve not actually learned much about Spackman as a person, I’m afraid, but hopefully something about what trout fishing was like in the 1890s. Let me finish by making one more comparison. Spackman writes of the worthy angling potential of many waters we would now never consider, such as the Porirua Stream that flows from Tawa into Porirua Harbour. As a trout habitat, it is, to put it bluntly, “stuffed” and I doubt that anything much lives there today. Thus in some ways, as we all know, environmental conditions have deteriorated. But then, he writes of the Clutha River then being so disturbed by gold sluicing that it was unfishable “for 40 miles”. Not any more. So, we win a few and lose a few. There is a heap more fascinating stuff in this little book – read it, if you can find it. I suspect that where present in libraries, it is so old and valuable that it will be in the reference collection.
3.3 A man with an eye for a species

Fish and Game 33, 2008

R M McDowall profiles Gerald Stokell, foundation amateur ichthyologist.

Gerald Stokell was a somewhat enigmatic character for whom, over the years, I have had growing respect. As a brash and youthful student, I found it easy to see his faults. With the passage of years, it has become increasingly apparent that some of the things he did were quite remarkable.

Stokell lived with his parents and siblings on a small property on the outskirts of Christchurch. After the death of his parents, Gerald, with his brother Clement and sister Eugenie, lived on in the family home, where the brothers raised and sold orchids. One gains the feeling that it was not exactly a profitable enterprise, but they made do. None of them ever married. Gerald and Clement became keen trout fishermen in the waters around Lake Ellesmere and Gerald first appears on the local fish/fisheries “scene” during the 1920s as a member of the North Canterbury Acclimatisation Society Council.

He was a thoughtful man of strong convictions and seems to have had no hesitation in making his views known. There are stories that when Gerald was unable to attend NCAS meetings, and felt that he had something important to contribute, he sent Clement as a stand-in! But gradually, Gerald’s interests shifted. His interest in trout fishing led him to become interested in the condition of trout in Ellesmere and he wrote a report on the ill-condition of the fish, moving on from there to studies of trout parasites. In doing so, he obviously came across various of our native freshwater fish species and no doubt very soon found how little was known about them – he would not even have been able to identify many of the fish he was encountering. Imagine the circumstance where the commonest and most visible fish species in most Canterbury rivers, the upland bully, was unrecognised as a distinct species – and that’s what he would have experienced. Despite having absolutely no training in ichthyology (the scientific study of fishes) or in taxonomy (the recognition and description of species), Stokell gradually launched into a series of studies of native fishes, and these became his prime interest, though he never abandoned an interest in salmonids and continued to publish papers on them. Beginning in 1928 and lasting until his death. Stokell wrote paper after paper on native fish. To place his contribution in perspective, 10 of the 36 species native New Zealand freshwater fish species now recognised were discovered and first described by Stokell – he had an “eye for a species” and no one has described more. He made some mistakes that derive largely from his lack of training (he never got past primary school), but we all do, and that he did not make more is surprising. And when I came to view the fish collections upon which his studies were based, I was stunned at how pathetically little he had to work with. It always amazes me that he discovered fish like the longjaw galaxias, which spends its entire life hidden among the gravels and cobbles of the river margins in some of our high country rivers. This fish is hard to find even with an electric fishing machine, a luxury that Stokell never enjoyed.

One of the species he described was the bluegill bully – another fish that you’ll never see unless you make a concerted effort because it lives in the very swiftest waters of the rapids in our lowland rivers. The story of this species’ discovery is a quite fascinating fragment of history. Carl Hubbs, an American who can probably be ranked as one of the greatest ichthyologists of his time, came to New Zealand for a Pacific Science Congress, in 1949. Hubbs and Stokell went collecting together and I find it really fascinating to imagine this great man at work with nets in our rivers alongside the totally untrained Stokell. Between them, they found the first specimens of the bluegill bully ever seen by “science”. Stokell expected Hubbs to return home to the United States and formally describe the fish, but this never happened. Eventually, exasperated by the delay, Stokell did so himself (not till 1959, a decade later) and named it after Hubbs, and so we have Gobiomorphus hubbsi. Between 1928 and his death in 1972, Stokell published about 40 scientific and popular articles about fish and fisheries in New Zealand freshwaters and he clearly ranks as the premier freshwater ichthyologist in New Zealand over that period, despite his lack of training. Included among his publications was a useful little book on our freshwater fishes (published in 1955), the only book of its type to that time.
Stokell endured a rather stormy relationship with journal editors, perhaps occasioned in part by his lack of training and, as you trace his publications through the years, the spats he had with editors are reflected by him shifting from one journal to another, as he submitted his articles. I never met him, though our careers overlapped a little. He kindly sent me some reprints of his papers early in my career, along with an encouraging letter, but terminated all contact when I concluded that the name he used for one species (the redfin bully) was wrong and published on it. So I, too, experienced a somewhat turbulent, if very brief, association with him, such as it was. I did see him in action, once — at a congress of the Royal Society of New Zealand, in Wellington around 1961. Stokell was to give a paper, and turned up with 2 1/2 inch epidiascope slides to illustrate his lecture. Unfortunately, the organisers of the conference did not know he needed a special projector and so one was not readily available. He was visibly unhappy about this during the 10-15 minutes it took the organizers to rush around Victoria University and find one — much to his and everyone else’s relief. No doubt he was, in part, ill-at-ease among a quite powerful scientific fraternity at the congress and moreover was disturbed by the attention the fuss created. Interestingly, I remember the turmoil well, but have no memory of what his paper was about. In a way, this sort of thing seems to have rather epitomized the man.

Despite his growing interest in native fish, he did not lose interest in matters relating to acclimatisation societies and trout fishing. Because of his growing knowledge of native freshwater fishes, he became a member of the Canterbury Branch of the Royal Society and eventually chairman of the branch. He was later nominated for Fellowship of the Royal Society (quite an honour), but turned this honour down, presumably at a time of one of his spats. Stokell’s position as branch chairman provided him with the opportunity to present an “Annual Report” and he exploited this opportunity to the full, presenting a stinging critique of the acclimatisation societies (with which he had also, by then, obviously and thoroughly fallen out). So passionate was he about the points he made in his speech that he had it published privately as a small booklet (and presumably at his own expense). It makes fascinating reading and I will use most of the rest of this article to repeat some of his points. But before doing so, let me finish this brief account of his life story. Gerald died in 1972, having never moved out of his family home and he predeceased Clement and Eugenia. He was buried in a small county cemetery in Shands Road near where he lived and his tombstone is a rather grand structure, which, of particular interest to me, has the profile of a redfin bully carved into the marble — obviously taken from one of Stokell’s scientific papers and, one can imagine, probably instigated by Clement.

But, back to his booklet. He described acclimatisation societies as “bodies ... composed of the purchasers of licences to kill either fish or game, that these composite groups of killers elect councils to receive the killing fees and manage affairs generally ... the most surprising circumstance [being] that the killers should have control of the animals they kill; that the sole qualification for safe-guarding the welfare of wild creatures should be the possession of a desire to kill them as manifested by the purchase of a killing permit”.

Later, he goes on: “You can spear a trout for a fine of £2, but if you take one on the fly, without previously enriching the Acclimatisation Society to the extent of the license fee, it costs you £5. The cardinal sin is not against wildlife, but against the Acclimatisation Society, and relates to the least worthy of all objects – money”.

Moreover, he thought it “surprising that the administration of the native bird legislation ... has not been placed in the hands of a body existing for the express purpose of protection, instead of being entrusted to the acclimatisation societies which are composed almost entirely of killers”.

Do you, like me, get the distinct feeling that Stokell was having a bad time with the acclimatisation societies? But, let’s not leave the man with such a negative perspective. Let’s remember his quite substantial contribution to the understanding of our freshwater fish fauna (both natives and salmonids), despite the limitations he had both in background training and in support for the work he did – much of it alone, as an amateur, though sometimes with support from the Canterbury Museum, in Christchurch. Stokell left his modest estate to the museum, for use in natural history displays there.
3.4 Thoughts from the top

*Fish and Game* 40, 2003

R M McDowall profiles L.O.H. (Leonard) Tripp.

If you look carefully on a New Zealand map you will find a location called “Tripp Settlement”, sitting at the toe of the foothills in mid-Canterbury. The Tripps, with the Aclands, were very early (and closely associated) colonial settlers and farmers in the area – the Tripps still at Orari Gorge Station on the Orari River, and the Aclands at Mount Peel Station on the south side of the Rangitata nearby. It is a fabulous part of the South Island, rich in history and with scenery that is quintessential New Zealand. The upper Rangitata is one of the most beautiful places in our country and that’s some accolade.

Tripp also appears in the name of one of our country’s largest corporate law firms, that was formerly Chapman Tripp. What, you ask, has this to do with Kiwis interested in Fish & Game New Zealand? Let me explain.

The Tripp of law firm Chapman Tripp was one of the Tripps of Tripp Settlement. Of present importance, he was L.O.H. (Leonard) Tripp, who was with little doubt the most significant, enduring figure in the history of the acclimatisation societies. Based in Wellington, he was a Wellington Acclimatisation Society councillor and president, which in itself is no great accomplishment. But, first elected to the Wellington Council in 1901, he became chairman in 1905 and held that position until 1954 and so was involved with that society for 53 years – quite a feat. In addition, he was elected chairman of the New Zealand Acclimatisation Societies Association, also in 1905 (the NZASA was formed in 1903), and held that chairmanship until the association was disbanded in 1936.

With regard to Tripp’s involvement in both the Wellington Acclimatisation Society and the NZASA, one might wonder how much time he spent working for his law firm! But the early 1900s were gentlemanly times and even “busy” people had time to get involved in such matters as acclimatisation societies. Also, the societies ranked as “significant” parts of colonial society and so demanded the attention of “significant” people. As chairman of the NZASA, Tripp had the confidence of his fellow delegates, who continued to re-elect him, year after year, for as long as the NZASA existed – and even on the rare occasion when Tripp was unable to attend. So, involved for half a century with the Wellington Acclimatisation Society, and a partially concurrent third of a century with the NZASA, Tripp had an influence on fish and game matters that can only have been highly significant, if not profound.

It is possible to get some measure of the man by reading the Reports of the NZASA, rare copies of which can be found here and there. Tripp soon adopted the habit of delivering a “chairman’s report”, which I would describe as a homily that summed up his perspective on acclimatisation matters, usually with a Wellington Society bias, often with a message to politicians. As you read these, you can obtain a clear sense of the development of the acclimatisation society movement and of the way various issues evolved over time.

Clearly, Tripp was a passionate conservationist and spoke of conservation with strong conviction. He observed the success that setting aside Kapiti Island had been for native bird conservation and year after year he urged the government to do the same with all of New Zealand’s offshore islands (and of course, it has increasingly happened). He recognised that these islands might offer sanctuary to endangered birds – recommending kakapo for instance (maybe he had heard of the work of Richard Henry in Dusky Sound). Later, he added the need for the islands to have caretakers to ensure preservation of their wildlife.

Another passion was the need for research. He travelled overseas on several occasions and consulted fisheries experts in North America and Britain, returning with strong views about our need for scientifically-trained experts to advise on management of our trout fisheries. He recognised that in Lake F. Ayson (“I’ll write about him in another in this series) we had a worthy New Zealand Inspector of Fisheries. He mentioned the need for research in his chairman’s report every year and it is no surprise that this was eventually implemented, initially as a result of funding from the Wellington Society of
which Tripp was also chairman. £1,200 was made available – then a substantial sum as most New Zealanders would have lived in houses costing a fraction of this. The appointment of Captain J.S. Phillips was the tangible beginning of that work and it is impossible to underestimate the historical significance of these actions to research.

Before long the societies had a national research committee and one of the leaders on the committee, Derisely Hobbs, eventually became a full time researcher funded by the societies. Later Hobbs was famous for his insights into trout ecology.

Not all of Tripp’s pontifications were as insightful. He was lured by the potential of hatchery stocking, liberating pheasants, and of killing hawks, eels, and other predators – though he did express some doubts that it was a good idea “to kill out” hawks! He accepted current dogma that possums were not a threat except perhaps to orchardists and he noted that it was “believed that possums could be fenced and there was a possibility of forest areas being set aside as an opossum farm”. He was persuaded about the threat from rats, commenting that it was “unfortunate that rat skins were worth very little”. But he railed against pollution (especially prevalent was a problem of sawdust in rivers – sawmills were then truly sawmills, driven by a watermill, and so were often on riverbanks). He demanded fish passes on dams. He favoured a reduced number of acclimatisation societies as a way of increasing effectiveness. And he was forthright that trout being culled from Lake Taupo, at a time when the lake was overstocked and the fish in poor condition, should be marketed. Some of these ideas will generate agreement today, while others will cause heated debate.

Two more of Tripp’s passions are relevant still. He regarded the acclimatisation societies as holding a significant place in New Zealand’s colonial history on account of their having brought trout to New Zealand and having got them established, providing an asset of high value. And having contact with overseas visitors, he was often told that angling in New Zealand was too cheap – and that tourists would willingly pay a significantly higher licence fee. He agreed and said so. We still hear talk of a tourist fishing licence, yet nothing tangible has been done about it.

So, what can we make of this man and his role in angling and hunting in New Zealand? It is hard to make an assessment in terms contemporary with his life in Wellington in the first half of last century and in some ways that is the only fair appraisal. To be sure, his commitment to the acclimatisation societies was substantial and enduring and he was well-accepted by his peers. In some measure, he was a man of his times and held views prevalent in those times as nearly all of us do – some of them wrong still. But he was also a visionary, especially with regard to the need for research. Some readers may say, rather cynically, that that is what they would expect me, a research scientist, to say. Maybe so, but that makes it no less true, and I have some pride in being part of the succession of fisheries biologists who have served New Zealand over the past century, a succession in substantial measure begun by the Wellington Acclimatisation Society, urged, no doubt, by the insights of Leonard Tripp.
3.5 Master of Salmon

*Fish and Game* 41, 2003

R M McDowall profiles New Zealand’s first Inspector of Fisheries, a man with the unusual name of Lake Falconer Ayson.

The name Lake Falconer Ayson has pretty much disappeared from the contemporary literature on fish and game matters in New Zealand and that’s a shame. He deserves better and this article is aimed at restoring the man to the place he earned in our annals of fisheries and acclimatisation. Specifically, and at the most general level, Ayson deserves to be remembered as the country’s first Inspector of Fisheries. But there is much more to his life than that. Quite a bit is known about his beginnings, so let’s go back to those.

Ayson’s parents were early Scottish emigrants, arriving in New Zealand in 1853 and taking up farming in South Otago, where L.F. was born in 1855, the 13th of 14 children. He worked on his family’s farm for a while before working elsewhere as a farm labourer – fencing, ploughing, harvesting, and shearing. Eventually, he moved to Duntroon and worked up the Waitaki River valley as a rabbit inspector. He became a keen trout angler and at some point he evidently met with F.S. Pillans, an Englishman who also farmed in South Otago and who seems to have had experience in fish culture – recall that this was early in the days of trout hatcheries, even in Britain and North America, let alone New Zealand. In 1886, Ayson moved to Masterton as curator of the Wellington Acclimatisation Society hatchery. Just what enabled that move is unclear, but maybe knowing Pillans helped.

Then in 1898, the government sent him overseas to investigate various fisheries questions, in Europe, Britain and North America, and when he returned he was appointed the first Inspector of Fisheries in the Marine Department, a position he held until 1926 (presumably he knew he had the job before he went overseas). Much of what he did in his overseas travels related to marine fisheries and he came back determined to see New Zealand’s developing marine fisheries managed on more scientific principles. However, other aspects of his travel were to have a significant impact on recreational fisheries. When in North America, he was offered Chinook salmon ova by American fisheries agencies and sockeye ova by the Canadians.

On returning to New Zealand with these offers, he persuaded the government to invest in a substantial salmon hatchery that was situated on the Hakataramea River, a tributary of the lower Waitaki (remnants of the hatchery are still visible there). Ayson would have been well aware of the immense effort already expended in trying to establish Atlantic salmon here and also that there had been some investment in Chinook salmon. He surmised that the likelihood of success would be greater if intensive effort were invested in establishing the fish in just a single river and, that once established, the salmon would spread naturally up the coastline and establish themselves in other rivers.

Over a period of years in the early 1900s, several large batches of Chinook salmon ova and one batch of sockeye ova were brought from North America to the Hakataramea. They were incubated there, some released into the Hakataramea itself, and some (including sockeye) released in the headwaters of the Waitaki River. Sometimes Ayson went to California to accompany the ova back to New Zealand himself and sometimes they came in the care of American fish culturalists. Most of the fish were released as fingerlings, but he thought that the likelihood of success might be greater if some fish were reared on in freshwater to an age of two or three years before being released and this was done. In retrospect, it was probably unnecessary. Within just a year or two, adult salmon were returning to both the Hakataramea and the Waitaki river headwaters, indicating that sea-run populations of Chinook salmon had become established, though sockeye only ever had a landlocked stock in Lake Ohau, high in the Waitaki catchment.

It might be assumed, from his success with Chinooks (compared with unsuccessful introductions during the 1800s), that Ayson was correct – that success was more likely if all the releases went into a single river. But it is more likely that success resulted from another cause – basically that a different
stock of Chinooks was being brought here. It seems that Californian Chinooks were better suited to acclimatisation here than those from further north along the Pacific Coast of North America that had been imported during the 1880s.

Whether he was right or wrong on that score, Ayson was certainly correct in his hypothesis that the fish would spread up the coast. Though salmon are known to home to their birth river on returning from the sea, some of them don’t, but wander into other rivers, and this is what happened. Within a few years, salmon runs had developed in all the larger rivers up the Canterbury coast, as far north as the Waiau and Clarence, a few reaching the Wairau in Marlborough, and anglers were soon enjoying the first salmon fishing in New Zealand’s history.

One of Ayson’s prime goals in getting Chinook salmon established was to see a commercial fishery develop, similar to fisheries he had learned about on the Pacific Coast of North America. He was unsuccessful in this – numbers returning never reached those needed to sustain commercial exploitation. Attempts were made to trawl for salmon off the coast and these were a failure. Exploitation was shifted to netting of salmon in river estuaries for sale and this was also largely a failure, though it was possible in the Waimakariri River, north of Christchurch, and continued for several decades. Anglers never accepted commercial exploitation of what they had come to regard as ‘their’ salmon and eventually the government was persuaded to regard the salmon resource as best left to recreational angling.

Having had success with Chinook salmon, Ayson was confident that he could do the same with Atlantics and he persuaded the government to make continued substantial importations of Atlantic salmon ova. Massive releases were made, especially into the Waiau River in Southland where another big hatchery was built, but success was to prove elusive. Eventually, all that became established was a land-locked stock in the Waiau River, primarily in Lake Te Anau. Much to Ayson’s dismay, and to the disappointment of expectant anglers, there was never to be a sea-run stock of Atlantic salmon in New Zealand. This repeats the global experience – no-one has succeeded in acclimatizing anadromous salmon stocks, anywhere in the world.

Ayson was also involved with importing other species. Along with salmon, he arranged for consignments of whitefish ova (species of Coregonus) to be brought from North America. Many millions of ova were liberated in Lakes Tekapo, Kaniere (near Hokitika), and elsewhere, but these were never seen again. Like other whitefish importations before them, they were a failure and there has never been a stock of whitefish in New Zealand.

Ayson also had some broader interests. He thought that there was potential to get various marine species established and was involved in construction of the Portobello Marine Fish Hatchery in Otago Harbour. A menagerie of marine species, including lobsters, shrimps, crabs, flounders, and other species, found their way from Europe to Portobello, were liberated into Otago Harbour, and were never seen again.

Ayson came back from North America also with several hundred Virginian quail and some Canada geese. He also recommended that wapiti and whitetail deer should be imported as well as an assortment of additional gamebirds. Clearly, these proposals were outside Ayson’s areas of personal responsibility as Inspector of Fisheries. It was Ayson’s counterpart, Thomas Donne, in the Tourist Department, who was the ‘big mover’ in the area of game introductions and who gets most of the credit (or blame?) for bringing Canada geese and wapiti, as well as various other game animals, to New Zealand.

Despite his contribution to freshwater fisheries, Ayson was probably held in rather poor regard by the acclimatisation societies and lack of reference to him in reports of meetings of the New Zealand Acclimatisation Societies Association during the early 1900s may reflect this. At about that time, Ayson was asked to prepare a report on the Taupo trout fishery (which was in disarray, as the fish were hugely abundant and in poor condition, having basically ‘eaten down’ the food available until it would no long support the fishery). In preparing his review, Ayson went rather beyond his brief, recommending that
the government should place all the country’s trout fisheries under control of the Marine Department and specifically under management of a skilled expert (who else, but himself?). He argued that his department had a “staff of skilled fish-culturists and fishery officers… already equipped to carry out the work with no extra expense to the country as far as salaries are concerned”. (Why were they there, if they didn’t have enough to do already?). This was really a rather thinly-disguised attempt by Ayson to enlarge his own responsibilities and it didn’t happen. So, I suppose with some justice, Ayson was probably viewed by acclimatisation societies with some distrust – though his role as the one who achieved establishment of Chinook salmon here should result in him being viewed by history as someone for anglers to be thankful to.

I wonder how he would view the present decline in the salmon fishery.
3.6 A man for his time

*Fish and Game* 43, 2004

R M McDowall profiles Tom Andrews, the Wellington ranger who epitomised the kind of field staff that characterised early acclimatisation societies.

I suppose each of us has a few individuals who influence our growing up and who we remember with clarity for various reasons. Today they’re called role models, but in my youth they were just thought of as nice or interesting people. Tom Andrews was such a person for me, in his position as ranger for the Wellington Acclimatisation Society in Palmerston North. Moreover, as I look back, Tom seems a fine representative of the sorts of men who were rangers for the old acclimatisation societies. So I thought it worthwhile to portray something of the character of this fine man. Were he alive today to read this, he would probably be embarrassed and mutter: “Just doing my job, boy. What would you expect?”

I know a bit of Tom’s background, partly because I encountered him in my boyhood and I also happened to meet up with his son Mike at a school reunion recently. We enjoyed reminiscing about his dad. Mike told me that he was actually Tom’s grandson, but was reared as a son (not learning he was actually a grandson till later in life). “Couldn’t have had a better upbringing”, Mike told me last Easter, so he too clearly retains warm affection for a man who died 40 years ago. And knowing Tom as I did, I can imagine that it was so – a strong, firm, kindly man for a father and also a warm, welcoming, capable woman for a mother, usually with fresh scones in the pantry and generous to share them with visiting lads. They were people who would offer a loving home to a lad who needed one, as Mike did.

My earliest contacts with Tom had an interesting genesis. In those days (the early 1950s), acclimatisation societies paid bounties on vermin – a few pence for hedgehogs’ noses and three or four shillings for a weasel, ferret, or stoat tail. My grandfather was a dairy farmer near Levin and had continual problems with mustelids. He’d trap them to avoid mayhem in the henhouse and he killed hedgehogs around the farm. He’d dry the tails and salt the hedgehogs’ noses and thread them on a wire and when we visited the farm (as we often did) he would give them to us and say: “Take them to the acclimatisation society” and, of course, we complied. When we returned home, we’d bike over to Tom’s house with our bounty. On the surface, he seemed a rather gruff old fellow and would grumble a bit about having to write a cheque for a few shillings, but he never declined to pay up – nor did he grumble enough to dissuade us from going over with just one ferret tail! We’d high-tail it back home with the loot in our pockets – seemed like something for nothing to us and a few shillings were not to be sneezed at. Interestingly, late Labour politician (and eventually ACT Party activist) Trevor de Cleene, lived near us, went through high school with my older brother, and was known to claim that he financed a fair bit of his university studies from acclimatisation society bounties.

Despite seeming a bit gruff, Tom would always tell us about something interesting that was going on. He’d show us his racing pigeons and eventually gave us a couple of pairs. He introduced me to Notornis – magazine of the Ornithological Society of New Zealand, in which there were excited reports at that time about rediscovery of the notornis (or takahe) in Fiordland. As a result, I became a member and this no doubt fostered my interest in natural history, leading to a career choice in later years. So, Tom was certainly influential in my life and I’ve no doubt he was for others, too.

Born in 1886, Tom trained as a boilermaker, spent a few years felling bush near Motueka, worked for the railways, and began with the local acclimatisation society in 1924. As was almost certainly the case with all the early rangers, he had little explicit qualification for the job, but like so many came into the position with the sort of background that made a chap self-reliant, strong, and practical, had integrity and could be relied upon to do a job with little supervision and, of course, was interested in fisheries and wildlife. He was to stay in the job until 1959 (aged 73) and died in 1963. His was a long life of faithful service to fish and game management, rewarded by a “substantial bonus” on his retirement.

Tom was called “Ranger Andrews”, and that’s what he was (today he’d have the grandiose title of Field Officer). He started off with a motorcycle and sidecar for transport, before graduating to a small truck.
Much of his work related to law enforcement, catching miscreants fishing or shooting out of season, or without licences, or breaking one or other of the fishing and hunting regulations. There were additional society staff in Wellington, a manager at the trout hatchery in Masterton (where L.F. Ayson began his fisheries career, and the society had a ‘game farm’ rearing deer and pheasants at Paraparaumu. But Tom would probably have seen these men relatively rarely and would often have worked alone. For many years at the end of his career, he was the only ranger that Wellington had. Being an acclimatisation society ranger, then, meant that you had to be a particular kind of individual – content with your own company so that you did not go slowly nuts from working alone and yet having people skills that made law enforcement viable. Clearly, personal honesty was a crucial element, as it would be easy to skive off for the day, or week, or go off the rails in the absence of close supervision. All sorts of practical skills were needed. Tom met all these demands. There was no Resource Management Law, or Environment Court in those days, but pollution was a problem especially sawdust from sawmills often built on riverbanks (some of them, of course, originally driven by water mills). Life for a society employee in the 1930s to 1950s was a very different occupation compared with today.

Tom made an immediate mark on his appointment, in a series of articles by “Ranger Andrews” in society annual reports on native birds. He developed a love of birds in his years in the bush behind Motueka. And from the late 1920s, each annual report had an article that talked of kakas and tuis, bellbirds and pigeons, grey ducks and blue ducks, of their distribution, how they were doing in the bush, the effects of land development and, in the case of grey ducks, whether or not they would hybridise with the introduced mallards. And there was discussion of the growing problem with magpies, as they spread and the need to control them. Eventually, Tom’s articles were curtailed by advent of the WWII, when acclimatisation society reports became very brief documents. If you can find them, have a look back at reports for the late 1920s and early 1930s, where you will find all sorts of interesting tidbits about native birds, and capture some of the keen interest of a gifted naturalist.

Tom played a pivotal role in establishing mallards. The societies had been trying to get them established for decades, with little success. According to Mike, Tom’s son, birds were obtained from A.C. Whitney (of the Colonial Ammunition Company and much involved with the Auckland Acclimatisation Society). Tom dispersed the ducks among some farmers that he reckoned would raise and breed them. They did so. When the Acclimatisation Society could no longer provide food for the ducks in the 1930s depression, the ducks were allowed to go wild and, as Tom hoped, formed the foundations for the flocks of mallards that hunters now shoot. He worked with some of the early wildfowl researchers from Internal Affairs, including Ron Balham, who became an ecology lecturer at Victoria University when I was a student.

But Tom had all sorts of other responsibilities. He and his fellow rangers were involved in culling deer in the hills of the Wellington district, as numbers grew too high and the quality of the heads deteriorated (recall that acclimatisation societies once managed deer populations). Another responsibility related to the societies’ role in managing possums and Tom was involved in preventing poaching and ensuring that only licensed trappers were selling skins. He established and manned traps to catch trout spawning runs, from which millions of ova were taken, year by year. These were hatched and reared at the Masterton hatchery and were sold to acclimatisation societies around the country. He trapped eels, in a period when they were thought to menace development of our trout fisheries and also in relation to a search for vitamins during the war. And he had a role in controlling hawks, though his reports indicate that he didn’t think they were much of a problem. These were responsibilities that virtually all contemporary rangers would have had.

But times have changed and so have the roles of the inheritors of responsibility for managing recreational hunting and fishing. People like Tom Andrews are rarely employed by Fish & Game Councils these days, though there is no substitute for hard work, self-reliance and integrity, even now when so much more of the work of the ranger or field officer is desk bound, coping with the paper war. For the early and middle years of last century, Tom Andrews epitomized the sort of staff the acclimatisation societies needed – he was a man for his time and is one for whom I have a persisting, warm regard.
3.7 A game importer extraordinaire

Fish and Game 45, 2004

R M McDowall profiles Thomas Donne, early importer of everything from moose, chamois, and bharal to wapiti, wood duck, geese, racoons, and mackinaw trout.

Thomas Donne is probably best known today for having written two of the earlier and more influential books on fishing and hunting – The Game Animals of New Zealand: an account of their introduction, acclimatisation, and development, published in 1924; and Rod Fishing in New Zealand Waters, published in 1927. These books are now collector’s items. Donne also wrote a third book called The Māori past and present, published in 1927, which is Donne’s version of Māori history and ethnohistory. What status that book has, among modern Māori ethnologists, I have no idea.

Probably, however, Donne ought also be remembered by outdoor sportsmen for quite different roles because he had other significance to the history of angling and hunting in New Zealand. He was appointed General Manager of Tourist and Health Resorts in 1901 and was placed in control of the country’s mineral-water spas in Te Aroha, Rotorua, and Hanmer. He was also charged with the development of important New Zealand holiday resorts in places like Taupo, Waikaremoana, Wakatipu, Te Anau, and Manapouri. But he seems to have had other ideas. Based in Rotorua, he had soon wrested control of the trout fisheries in the northeastern North Island – in Rotorua, Taupo, and the East Cape area – from the Auckland Acclimatisation Society, an occurrence provoking deep resentment among members of the Societies. Donne had bigger ambitions, wanting to take over control of the entire acclimatisation society movement, as he thought that “localism should be replaced by a central authority exercising absolute jurisdiction over the whole acclimatisation work in New Zealand”.

Donne’s control over central North Island trout fishing was not to last long as, by 1913, the Department of Internal Affairs had assumed control of the Rotorua and Taupo trout fisheries. Acrimony between the government and the acclimatisation societies, resulting from the original takeover, continued for decades. Interestingly, Lake Ayson, who featured in this series in Issue 41, also had this ambition. Neither succeeded.

Rather more significant was Donne’s role in bringing the most extraordinary menagerie of game animals to New Zealand. Donne was familiar with a letter that had been sent from the British Parliament to the various British colonies in 1863 and he thought that, if this policy had been pursued with a little more energy and insight, “many interesting specimens of fauna and flora would, in all probability, have been preserved from extinction…”.

Donne set about trying to remedy the shortcomings that were, to him, so obvious. He enlisted as allies people as diverse as the Duke of Bedford in Great Britain, President Theodore Roosevelt of the United States, and Emperor Franz Josef of Austria. The diversity of game and other species that Donne wanted to see established here knew few bounds and a surprisingly large list of what has become established may be credited to Donne. As Donne put it in his 1924 book: “With the constructive and interesting work of transplanting and acclimatising animals, birds and fish, I…have been directly concerned with the introduction to New Zealand of: chamois; moose; wapiti; red deer; sambar deer; axis deer; Virginia deer; mule deer; sika deer; tahr; and bharal”.

Almost all of these would be familiar to those who know anything about the history of game hunting in New Zealand, except bharal, which is a Tibetan sheep. All were more or less successful, except axis, mule deer, and bharal; whether moose were really successful is a moot point, with the jury still out as Ken Tustin pursues his fascination with determining if there is still a residual moose population somewhere in Fiordland.

Donne saw the question of establishing game species as: “This great work, so well and unostentatiously carried out by the government and acclimatisation societies of New Zealand”, Donne, was a little too ‘modest’, as in addition to the above, there is a long list of birds and other fauna he was involved with from time to time.
One of Donne's first importations was moose – he had arranged a consignment of 14 animals that were shipped to New Zealand in early 1900, but 10 of them died in a storm and only four arrived in early February 1900. The survivors were shipped to Greymouth and, to Donne's obvious displeasure, the animals were assigned to the care of Lake Ayson, then New Zealand's newly appointed, first Inspector of Fisheries. Donne made his displeasure quite clear, writing, rather testily: “Ayson is essentially a fish expert, his inclinations and experience do not lie with animals.”

One cannot help but wonder whether the long-lasting antipathy between what eventually became the Rotorua and Taupo Conservancies of the Wildlife Service and the Fisheries Branch of the Marine Department had begun to 'brew' as long as 100 years ago, because Donne was so put out that Ayson, of all people, was assigned the care of the arriving remnant of his precious few moose. That aside, the four surviving moose, two bulls and two cows, were liberated in the Hokitika River valley, and the two bulls evidently took to the hills and forests and were never seen again. The cows appear to have stayed around the release site, one of them becoming both so tame and such a nuisance that it had to be forcibly relocated. Donne tried with moose again and this time managed to get 10 more shipped from Canada. These were released, presumably, this time under Donne's supervision, into the forests of Fiordland, where Tustin has a strong hunch some may still be still present. Whether or not there are, moose in New Zealand can scarcely be ranked as a success story.

Donne was particularly anxious to import and establish chamois, but owing to their rarity even then, in the European Alps, this was not going to be straightforward. Eventually, he managed to enlist the support of Emperor Franz Josef, of Austria. Donne related in some detail how he had managed to obtain chamois – several hundred were, somehow, herded down from the hills, with about 30 of them dying from the injuries and stress involved, and from these a number were chosen and shipped to New Zealand. They were liberated into the Southern Alps in the vicinity of Mount Cook. In this instance, Donne was able to gain such illustrious support through an offer of New Zealand wildlife, sending the Emperor four keas; five wekas; six paradise ducks; six grey ducks; and six tuataras. And though many of these died before reaching Austria, the Emperor must have been well pleased with what he did get, as Donne was later able to get some ‘fresh blood’ to hopefully reinvigorate the populations of chamois soon established in the Southern Alps.

Not satisfied with that, Donne went to the United States in 1904 in search of additional game species. He managed to elicit the support of President Theodore Roosevelt, an acknowledged game hunter. The list of animals that Donne was able to accumulate, and of which he reckoned nearly all reached New Zealand, included: 20 wapiti; 22 Virginia [whitetail] deer; 50 Canada geese; plus a total of more than 60 other birds including: Hutchins geese; canvasback ducks; wood ducks; pintail ducks; widgeon; black ducks; and Mandarin ducks; to these he added: five racoons; two horned owls; and two barred owls. Donne missed out on “two casks of diamond-back terrapins”, which could not be obtained in time for shipment, owing to snowy weather.

Access to the President appears to have been facilitated by an Englishman, Mr St. George Littledale, through whom the gift was arranged, again as a swap for some of New Zealand's rare and peculiar birds and tuatara. According to Donne, this “exchange was intended to be more or less of a formality to comply with the [US] law controlling the administration of the National Park, which does not permit its animals being given away by even so important a personage as the President”, who advised that: "Under the law I shall have to ask for animals valued at $300 from New Zealand in exchange", and evidently the President hoped, in vain, for a gift of some chamois. Littledale also appears to have been trying to get Donne some: Caucasian deer; Carpathian deer; Asiatic wapiti; ibex; and markhor from stocks in Great Britain. He seems not to have succeeded, but was involved in obtaining that through the generosity of the Duke of Bedford – well known from his interest in game animals. The Duke was also the source of some axis deer; llama; buff and grey rheas (South American ratites not unlike emus or moas). Where would it end?

Not mentioned so far has been Donne's role with Canada geese. Ayson enters the picture again here, as he brought the first few geese back to New Zealand with him from North America in 1900, but it
appears that these failed to become established. Another goose importation a few years later, this time by Donne, formed the foundations for present flocks of this Machiavellian bird. Donne, having chided Ayson for getting involved with game animals, was not averse to a little meddling with fish. Donne arranged a shipment of landlocked Atlantic salmon from eastern North America and it probably was this consignment that resulted in the establishment of a landlocked stock of salmon in Lake Te Anau. Also it was Donne who arranged for a consignment of mackinaw, or lake trout, to be imported. Ayson was involved here, too, as he brought the ova back to New Zealand, along with one of the big shipments of Chinook salmon at that time being imported. Though mackinaw survive in Lake Pearson near Arthurs Pass, there is no way this species could be regarded as a success.

Donne acquired and liberated a menagerie that would compete with Sir George Grey’s accumulation of exotic animals and birds on Kawau Island. Donne must have been a persuasive fellow, as he was able to get the New Zealand Shipping Company and the Shaw Savill and Albion Line to transport these various batches of animals and birds to New Zealand at no cost.

Donne did, however, experience some drawbacks that related to what he called “local prejudice [that] had to be overcome, both political and private”, complaining that: “one newspaper went so far as to seriously suggest that [he] should be put into gaol for bringing ‘wild beasts’ into the country”.

Moreover, G.M. Thomson, one of New Zealand’s leading colonial scientists, as well as a Member of Parliament, thought that the Tourist Department (and one can only assume this was a reference to Donne) was ‘dominated by the idea of dumping all sorts of animals from moose downward into this favoured land’.

So, though Donne clearly was pleased with his contribution, this did not get universal support in the early years of the 20th century. What seems quite amazing, 100 years later, was that there were apparently no checks and balances of any sort, no effort invested in evaluating potential environmental impacts, and no role for disease studies to ensure that significant stock pathogens were also not being introduced at the same time. Donne certainly left a substantial legacy, the nature of which likely depends on one’s point of view. But 2003 is very different from 1903, and perhaps we can be thankful for that.
3.8 Our legacy is at risk

Fish and Game 47, 2005

R. M. McDowall writes about late American Aldo Leopold, a revolutionary among fish and game managers. His diverse writings and philosophy on land use and environmental ethics have had a continuing monumental impact on the thoughts and actions of modern day fish and game managers worldwide. Leopold’s messages are of global importance and have never been more telling or appropriate than they are today, particularly in New Zealand.

Most anglers and game shooters will be well aware of the major changes that happened to the management of their sport when fish and game councils replaced the acclimatisation societies in the early 1990s. Most, too, would have some awareness of the prolonged battle waged by the old Wildlife Service to take control, but which was successfully thwarted by the societies. These, however, are only two of several significant changes that have affected the way we manage trout fishing and duck shooting over the recent past and, though they may seem the most obvious, I think they are of secondary importance. Perceptive sportsmen will have noticed a marked historical shift in emphasis – from managing species to protecting habitat. This, too, has been a long process, and it is still going on, there still being some who think that managing fish and game consists primarily of shooting shags and hawks, killing eels, and releasing pheasants and trout. The shift from managing species to managing habitat has, in my view, been much more significant than any of the organisational and structural changes.

One of the key individuals in the inception of these changes – which have affected fish and game management throughout the world – was American Aldo Leopold, author of a highly influential book with the uninformative title, A Sand County Almanac, and Sketches Here and There. Why anyone would pick it up, or buy it, with a name like that, is a mystery. Neither the book’s title, nor its presentation, even hint at its compelling contents, or its enduring and widespread influence on conservation ecology, wildlife, and land management. The book sold slowly in the early years after its publication in 1949, and the principal reason it did sell was probably that its contents were communicated by word of mouth, book reviews, and references to it in other articles and books. It became a best seller, with over a million copies printed, including translations into German, French, Russian, Japanese, and Chinese. Leopold wrote the book in the 1930s and 1940s, based on his experience as a forester during the early 20th century. Those who know of Leopold will probably have already read this small book – a series of essays, some previously published “here and there”, that Leopold assembled as an anthology shortly before he died in 1949. The “Sand County” was some exhausted, cropped out, almost worthless, land along the Wisconsin River that Leopold bought and tried to restore – an opportunity for him to apply the ecological, forestry, and game management ideas he had developed in the field and that, later in his life, he was teaching students at the University of Wisconsin, in Madison, where he became Professor of Game Management (the first such position/department in North America). What he discovered and put into practice was relevant to wildlife and fisheries ecology all over the world and has wide repercussions, including in New Zealand.

Leopold and his family renovated a derelict chookhouse on the property, which they called “the shack”, and they spent numerous weekends and holidays there. Over the years they planted thousands of trees and the property was Leopold’s base for all sorts of nature/ecology observations, recorded in a series of diaries – birds, mammals, frogs, insects, wildflowers, all getting attention. Though modern science would probably rank him as a bit of a failure, as he published little formal ecology, he became influential in fields as diverse as forestry, wildlife, game management, soil conservation, catchment management, wilderness protection, land restoration, and probably most significantly, environmental ethics.

In my view (and it seems, many others agree), Leopold ranks as equal with two other noted American figures in the history of conservation. One was Henry David Thoreau, known for his writing about time spent, mostly alone, in a small cottage on Walden Pond, in the woods of New England, near Boston (read his On Walden Pond, another American classic). The other was John Muir who ‘discovered’ the
marvels of Yosemite in the Sierra Mountains, one of the most loved American national parks, and Muir also founded the Sierra Club, a leading American conservation agency (read his book My First Summer in the Sierras). Thoreau, Muir, and Leopold left different legacies, yet each profoundly influenced how we view, exploit, and conserve natural resources, how we benefit from access to wild places in our daily lives, and how we should view ‘land’. Their messages are of global importance and have never been more telling or appropriate than they are today, in New Zealand as elsewhere.

Though Thoreau was a ‘muse’, and Muir something of a ‘loner’, Leopold lived in the ‘real world’ of rangers and forestry camps, bureaucrats and committees, university professors and students. Leopold’s A Sand County Almanac is his most accessible legacy, though he wrote lots of other articles, many of them published since his death in 1949. In addition, there is much literature structured around Leopold’s life, or interpreting his ideas. He has attracted a strong following, which continues to spread his ‘message’, including the Leopold Foundation in Wisconsin.

Leopold was born in 1887, in Burlington, Iowa, in the wheat and corn country of the plains and prairies of the American mid-west. You might imagine that life out on the prairie would hardly have provided background for an innovative career in conservation, like Leopold’s became. His family lived near the Mississippi River, where his maternal grandfather was also quite visionary, a hunter, fisherman, and general naturalist. And as a lad, Leopold explored the forests and wetlands nearby, hunting rabbits and other game, fishing with various of his family, and getting to know the local wildlife. This often included skipping his studies, whether at high school, or later at Yale University, where he earned a degree in forestry. Though not antisocial, or even a loner, he did like being out in the ‘wilds’ (and often); he found it a healing place to be, and so made time to spend on long walks, becoming a perceptive observer of nature.

Having finished his forestry degree, Leopold was employed by the United States Forest Service to work in the desert hill country of New Mexico and Arizona, an area that he had grown to love on an earlier, university excursion. At the beginning of his work, he found himself responsible for managing a forest survey gang – though ill-equipped by past experience to do so, and he nearly lost his job. But his superiors saw that too much had been asked of him and that he had considerable potential (and they were right on both counts).

Leopold’s early role was managing forests for wood production, with game shooting an ancillary benefit. Like most others of that time, he was primarily interested in species’ management, but very early in his career he experienced an ‘epiphany’, when out hunting. He had shot a female wolf and some of her pups, as he, like fellow foresters, followed the credo that the way to maximise game populations was to kill all the predators. Ecologists had not then recognised that predators in natural ecosystems are important for controlling excessive game numbers and it would be some time before deer became so abundant in parts of North America, owing to the culling of wolves and other predators, that there was insufficient food to keep the deer alive. Leopold would later describe the experience of this wolf dying in powerful terms: “We reached the old wolf in time to watch a fierce green fire dying in her eyes… there was something new to me in those eyes…something known only to her and to the mountain… I thought [then] that because fewer wolves meant more deer, that no wolves would mean hunters’ paradise. But after seeing the green fire die, I sensed that neither the wolf, nor the mountain agreed with such a view.” This event would haunt him throughout his life and, much later, form the background for one of his best-loved essays, ‘Thinking like a Mountain’.

The most compelling point in this encounter, for me, was that Leopold was very clearly identifying the ecosystem effects reflected by his experience. The “mountain” was perhaps Leopold’s poetic way of connecting the wolf to her ecosystem. And, though it seems to have been some time before it strongly influenced his conservation philosophy, he clearly carried this experience with him and was, in some ways, a changed man for the rest of his life.

Thus, early in his career, Leopold, like his fellow foresters, thought that control of vermin was needed to permit proliferation of game for hunters. On the face of it, of course, the connection between game abundance and the presence of predators then seemed obvious, and this was thought to require
removal of the predators. But before long, as he seems to have done throughout his career, Leopold was questioning the ‘conventional wisdom’ and was struggling to learn the lessons that nature was trying to teach him. Then, as later, and in fact continually, he would question traditional attitudes and practices in forestry and game management. He began also to see that all sorts of wildfowl, gamebirds, and deer were becoming seriously threatened, and so he confronted an interesting dichotomy – relating on the one hand to disappearance of some varieties of wildlife apparently at the hands of hunters and land managers and yet, on the other hand, proliferation of other wildlife species, particularly deer, to the point that the rangeland was overpopulated and the starving deer herds were ravaging the vegetation. Like his fellow foresters, Leopold initially called a variety of predators, like cougars, wolves, grizzly bears, coyotes, bobcats, foxes, and skunks “varmints with a bounty payable”, and were he in New Zealand he would no doubt have regarded hawks, and shags, and eels in the same way – though he would soon adopt a different view.

A year or two into his career, Leopold suffered a serious bout of nephritis (like All Black Jonah Lomu, though the impacts for Leopold were less drastic and he recovered after a prolonged convalescence). This illness required some time out and maybe it was by having a period without the pressure of things to do that gave Leopold some ‘intellectual space’, to do a lot of thinking. He read some of Thoreau and was influenced by his statement that “In wildness is the preservation of the world” (the statement for which Thoreau is most widely remembered). As Leopold put it, he came to “look upon our beneficial bird and animals not so much as gamefoods to satisfy his instinctive of killing, but as irreplaceable works of art done in life by the Great Artist”. I doubt that his associates in the Forest Service, or among the hunter and game shooter fraternity, would ever have read anything quite like that before and they wouldn’t have known how to handle the intrusion of poetic images or emotional language into their attitudes and beliefs. And yet Leopold would write like that, more and more, even though the connections he saw between hunting, killing, and eating game, and the deeply stirring emotions that he described, would have confused many people. Certainly his ideas were not welcomed by some senior Forest Service bureaucrats, though others recognised both his originality and perceptiveness and made space for him to develop the potential that they saw in him.

In 1937, Leopold was struck by the differences in the landscape in Mexico compared with the United States, just across the border, and especially that the Mexican landscape was not nearly as badly impacted by deforestation, stocking with cattle and sheep, and catchment degradation. He realised that all of his life he had been dealing with what he called “sick land” and he began to plead for the protection of biological diversity. He had begun discussing “species protection plans” as early as 1915 and throughout his life was aiming to “promote the protection and enjoyment of wild things” so that “every citizen may learn to hold the lives of harmless wild creatures as a public trust for human good”. He thought it important “to restore to every citizen his inalienable right to know and love the wild things of his native land”. And he had identified the problem of trying to conserve things that people were not familiar with – stating that “to cherish we must see and fondle” – though he feared that “when enough have seen and fondled, there [would be] no wilderness left to cherish”.

He became disenchanted with tourism and in another haunting story called, The song of the Gavilan, he described the “tourist” as a “motorized ant who swarms the continents before learning to see his own backyard…Recreational development [he thought] is a job not of building roads into lovely country, but of building receptivity into the still unlively human mind”. He once encountered a group of anglers, with their overlaiden guides hauling canoes through a remote forest, and Leopold no doubt experienced the same disillusionment that modern Kiwi anglers do, when helicopter-transported overseas anglers descend into a remote, hard-won mountain river valley. And, he argued: “If people want to ‘get back to nature’, the government ought to preserve a little nature to get back to.” He argued, and eventually successfully, for the setting aside of very substantial areas as true ‘wilderness’.

Moreover, he thought that “the privilege of possessing the earth entails the responsibility for passing it on, the better for our use, not only to immediate posterity, but to the Unknown Future”. Curiously, he reckoned that one of the wise habits of someone who “tinkers”, and specifically in his context of natural biological communities, is “to keep all the bits”. Notable in many Leopold statements is pithy language
like this, and a wry sense of humour, as well as the use of words like “love”, “cherish”, “fondle”, “beauty” – not really the language one expects of ecological science, let alone a pragmatic forester. All of this, Leopold wrapped up in the questions of “privilege”, “responsibility”, and “sustainability” and he wrote of “land ethics” and an “ecological conscience”.

Thus, quite clearly, he felt no need to constrain himself to the austere language of science and obvious and deep passion often emerges in his writing. That this language was apparently finding acceptance only emphasises that his audience was understanding and, to some extent adopting, his ideas. Leopold sought to inspire the ordinary people in human communities among which he worked, evidently realising that he couldn’t attract the support of politicians and administrators without having support from ‘ordinary people’. He became involved in setting up and/or supporting a variety of organisations involved in both game management and nature conservation. He was a founder of the Wilderness Society and became “father of the National Wilderness system”. And he wrote dozens of articles for newsletters and magazines both within and beyond the Forest Service, becoming very influential in identifying conservation priorities.

He increasingly saw inadequacies in the management of forested lands and, committed to sustainability, he became concerned about the cumulative effects of forest harvest, destruction of the understory vegetation, land erosion, the loss and degradation of the soil, and the consequential effects on stream catchments and faunas. He saw that vegetation, once removed, could be restored to the land, but that if the soil was gone, then the loss would be “absolute and irrevocable”. Today we might call his approach ‘holistic’. He became more and more passionate about soil. “The nation that destroys its soil, destroys itself”, he wrote, at a time when North America was still in the grip of its western expansion and when few would have seen any potential limit to the resources that human society could extract from the land. Though it might have seemed to be without limit, Leopold saw that it wasn’t. He wrote a handbook that explained how important watersheds were to soil erosion and land management and, of course, for forestry. In a way, this was his typically pragmatic response to needs he had identified. He rejected the attitude that “a right action is impossible because it does not mean maximum profits, or a wrong action condoned because it pays” and thought we should “examine each question in terms of what is ethically and aesthetically right as well as… economically expedient”. Some of this might seem a bit ho-hum in 2004, but here we are talking of the 1920s to 1930s and it was then insightful and revolutionary – though it seems to me no less relevant to us in New Zealand, today, with our pressures to build further hydro stations and abstract more water from rivers, or to allow deterioration of water quality driven by intensified land use practices.

Thus Leopold’s approach gradually shifted from producing timber and protecting game, to protecting wilderness as a recreational resource, which he saw as a “higher use”, thinking that conservation was a “state of harmony between man and the land”. And he came to see an underlying contest between those who saw utility and beauty in fauna and flora, as a whole, and those who only saw trout and pheasants to harvest. He wrote about beauty, of forests having more than material use and contributing to psychological and spiritual well-being. He saw the deep interdependencies in civilisation and nature, realising that every time he turned on an electric light, he was “selling out” to the enemies of conservation; that publications take trees; and that eating cream means cows. In an essay titled, ‘The engineer and conservation’, he wrote: “Our tools are better than we are, and they grow faster than we do. They suffice to crack the atom, to command the tides, but they do not suffice [to allow us] to live on a piece of land without spoiling it.”

Leopold increasingly discussed human responsibilities for nature and the ethics and morality of land use practices, though some of those around him no doubt wondered whether there were any such things as immoral use of land, or an ecological conscience. He argued for the integration of society, civilisation and nature, about the interactions between humans, plants, animals and soil, and about sustainability. Perhaps above all else, we need to recognise Leopold’s search for principles that drive practice, whether we are harvesting timber at one extreme, or preserving wilderness at the other – a search to conceptualise ecological relationships as a basis for management.
Ultimately, he thought: Something is “right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise…a land ethic changes the role of Homo sapiens from conqueror of the land community to plain member and citizen of it…The ability to see the cultural value of wilderness boils down, in the last analysis [he thought], to a question of intellectual humility”.

Recalling that this was happening 50 to 70 years ago, we must ask: ‘Have times changed?’ Well, not really in many ways, I fear. Leopold was a revolutionary among forest and game managers in the early 1900s, but I sometimes wonder how much we have learned since then, as we struggle to save forests, protect our rivers, and maintain water quality in our lakes. Would his ideas be any less revolutionary, today? When Leopold began to write about the “ecological conscience”, he took all this up another notch. Further passion emerges in another statement that “one of the penalties of an ecological education is that one lives in a world of wounds”, which is reminiscent of his comments about “sick land”. It is hard to imagine how his readers responded to this, or yet further, to his talk of a “land ethic”.

In 1924, Leopold shifted from the southwest to Madison, Wisconsin, to the US Forest Products Laboratory, a shift prompted more, it seems, by bureaucratic pressure than by any desire on Leopold’s part. He found himself in an alien environment and after a few years he resigned and went to work for the Sporting Arms and Ammunitions Manufacturers Institute, engaging in wide-ranging surveys of game populations, and in suggesting how game shooting could be improved. The timing of this shift was unfortunate, as funding dried up in the early 1930s depression and Leopold found himself without a job. But he had become well enough known across nearby states, as well as in Washington DC, to make a living as a consultant. As he became increasingly respected, he was appointed Professor of Game Management at the University of Wisconsin. Initially this was funded privately, but he was successful enough for the position to later be funded by the university, and so began the last phase in his productive life – finely balanced between one role in teaching and inspiring students and another best viewed, at least nationally, in the development of ecosystem management and wilderness conservation protocols.

At this point, it might be helpful to summarise the features of Leopold’s life and career that were so influential. I think there are several areas: one was in human attitudes towards land and soil – an almost Gaian approach that the world is a co-adapted and interdependent ecosystem with all sorts of feedback loops, so that if we abuse some part, then the whole suffers. Another aspect, not surprisingly, closely akin to the above, was that he argued for ecosystem management rather than species-based management, which I believe has been of particular importance to the history of fish and game management in New Zealand – though some outdoor sportsmen still don’t seem to have adjusted to the shift from managing species for game shooters and anglers to exploit, to managing species in their environment with exploitation just a part of that ecological web. If you think about it for a moment, it becomes obvious that all these essential qualities in Leopold sprang from a common source or concern – for the land. As far as New Zealand is concerned, and particularly as to how Leopold might have been influential here, it would have to have been the substantial shift that took place during the 1960s and since, that New Zealand fish and game managers underwent, like ecologists in many parts of the world – a shift towards habitat protection and management rather than species management.

Much of this began with Leopold’s insights – basically that there is no point trying to manage fish and game populations if they have nowhere to live, though if we protect habitat we are well down the track towards managing the birds and fish that live there. It is simple stuff really, but it seems that humans tend often to be more respectful of complexity. And, I suppose, another key element in all this is that Leopold took his message right to the outdoor sportsmen, writing his essays for them, as well as for bureaucrats and politicians.

It would have been interesting to be at a meeting between Aldo Leopold and New Zealand’s visionary trout biologist of the 1930s and 1940s, Derisely Hobbs, as Hobbs also was trying to encourage a broader, ecosystem perspective on managing our salmonid populations, again with an emphasis on habitat, and seeing the big picture (see my article about Hobbs in Issue 33, 2001, where I related Hobbs’ realisation that so many trout ova were deposited naturally in most of our rivers that hatchery releases made an
inconsequential contribution to trout stocks available to anglers and so hatchery releases were a waste of anglers' money). I've little doubt that Leopold and Hobbs, though coming from different countries, different backgrounds, and different experiences, would have found much agreement. As it happens, there is no evidence that they met, or even that the ideas of one had influence on the other. But both had revolutionary ideas that had much in common. Of course, too, both were dead right. Just as I believe that Leopold's ideas have had influence in New Zealand, Hobbs' ideas continue to influence North American ecologists though he died more than 40 years ago (see a recent article by Bob Behnke in Trout magazine, summer 2004, pg. 59-60).

Some have described Leopold's A Sand County Almanac as “almost a holy book in conservation circles” and one biographer alluded to Leopold becoming the “priest and prophet of the conservation movement”. Despite his writing being sometimes plain and direct, it is also often poetic and unusual in having moral overtones about how we use and manage natural resources. This, at least for me, makes it at once fascinating and inspirational. In the final analysis, he thought that “there must be borne in the public mind a certain fundamental respect for living things and for the epic grandeur of the processes which created them”, and he expressed fear that “we” may be judged in the “derisive silence of eternity”. Is it true of us, as Leopold thought of his followers, that “there will be an end of the pious hope that America [as a country] has learned from her mistakes... Each error, it appears, must continue to its bitter end; conservation must wait until there is little or nothing to conserve? I hope not!

So, get yourself a copy of Leopold's A Sand County Almanac – mine, secondhand, cost less than a roll of nylon. If you can't find one locally, then Amazon.com has a new edition that includes photos of areas related to Leopold's life. Or borrow a copy from the local library (if someone hasn't pinched it). But if you're anything like me, you'll want to read it and re-read it over the years. Put it on the mantelpiece by the fire, though not to just gather dust. Or leave it on your bedside cabinet, read a chapter before you go to sleep, let your sub-conscious work on it overnight, and wake up in the morning inspired. Let each chapter have its impact on your thinking and philosophy. The writing is beautiful and the ideas are revolutionary. I'd read the last chapter, called 'The land ethic', first; certainly it's his most famous essay. And I suggest you then go back to the beginning and read the whole book, as that way you get to read 'The land ethic' twice, once as an initiation into his ideas and again when it brings all the ideas in earlier chapters together!

Let me close with a final quote from Leopold's writing, which I hope might capture your imagination: “And when a flock of bluebills [scap] pitching pondward, tears the dark silk of heaven in one long rending nosedive, you catch your breath at the sound, but there is nothing to see but the milky way”. It's vintage Leopold that can't help resonate for any duck shooter who, peering into the gathering gloom of a winter's evening, has his reverie broken by a few shovelers, twisting, weaving, and whirring out of the sunset so fast that they are past before you realise they are coming, only to dump into a pond just beyond sight.

And what do we take from Leopold? I hope an ecosystem approach to fish and game management, inspiration about the values and pleasures of wilderness, and a galvanising into action to ensure that we take proper care of the riches among which we are privileged to live. Ultimately, Leopold would plead for ethical use of the land and an ecological conscience. We owe him nothing except gratitude for his writings, but we owe it to ourselves and our descendants to leave New Zealand a good place to live. I think that legacy is at risk.

The Aldo Leopold Foundation can be found at: http://www.aldoleopold.org

3.9 Bush Tucker Charlie’s Way

Fish and Game 50, 2005

R M McDowall profiles one of New Zealand’s early explorers and how he “roughed it unspeakably” in the wilds of South Westland on and off for 40 years; how he camped in conditions so cold “eels froze in the shallow lagoons”; how he avoided what became known as the “New Zealand death”; and, most importantly, what he ate, including “water serpents”, kakapo, weka, kiwis, pigeon, kaka, giant kōkopu, and “pretty much anything that would swim, run, or fly”. Today’s macho hunters and anglers often think they do it “pretty rough” in the backblocks of New Zealand’s wilderness, but few, if any would be hardy enough to match Charles Douglas’s feats.

There seems a growing awareness of the history of New Zealand’s colonial exploration, with a recent series of books and television programmes looking at various parts of our history. On the face of it, we might seem not to have much of an exploration history, compared with Lewis and Clark’s journey to the Pacific Coast of North America, or Wills and Burke’s crossing of the middle of Australia (by the way, the two rivers flowing into the top of Lake Wanaka, were named after Wills and Burke, which I didn’t know until recently).

Even though we may tend to disparage local effort compared with examples from North America or Australia, we have no need to, and some exploration around our land in the early decades of colonial settlement provides a story that ranks with the best anywhere. And there were some characters involved, as one might guess. My great grandfather arrived in New Zealand as a 16-year-old lad, jumping ship in Dunedin, having come from Scotland as a ship’s apprentice, and I often wonder what it might have been like for a lad to carve out a life in early colonial New Zealand – no family, no friends, no job, no money. He’d have had to be pretty self-reliant, a survivor as we may now call him, but no different from other early colonists.

One of the real characters of early exploration was Charles Douglas, known generally as Charlie, and having acquired the rather more grandiose title of Mr Explorer Douglas. He, too, arrived here from Scotland, though in 1862, and rather older than my great grandfather. He messed around a bit on the goldfields of Otago and West Coast, tried his hand at a bit of farming in South Westland. But neither suited him, and before long he settled into a life – I’m not sure you’d exactly call it a career – exploring and surveying in the western slopes of the Southern Alps, mostly in the far south from about 1867. He spent the rest of his life there. Apart from a brief stint farming, he never owned any property, no house, no furniture, it seems, and when he died he had nothing of any worth to bequeath to anyone – except, that is, a heritage of life spent in the mountain valleys and all that he discovered and mapped. It was a tough life, especially as for much of the time Douglas was in the mountain valleys alone, weeks at a time, and going into some pretty forbidding landscape – which prompts me to ponder what it might have been like had the regulations relating to occupational health and safety been in place. Douglas produced accounts of the mountain ranges, glaciers, and rivers that drained them for the colonial government, and lived it “pretty rough”.

In the winter of 1894, when up the Waiatoto, Douglas reported that “the frost froze the eels in the shallow lagoons”. He was there, camping, his bedding a blanket sewn down the side, and there were none of today’s polar fleeces and breathable waterproofs. And there were no huts. Douglas didn’t even bother with a proper tent, but operated from what he euphemistically called a batwing, which seems to have been little more than a sheet of calico fabric that he tied into the trees to provide shelter from the rain. And we don’t need to be told how it rains in South Westland. No doubt he became adept at using this minimal gear to try and keep dry, but there are also accounts of him sitting beside a bush fire with every piece of clothing sodden and sometimes being wet for days. One can imagine that he had some pretty superior skills at getting a fire going, in the wet and the rain, and unsurprisingly in his later years he complained of rheumatism. Evidently, Douglas clearly thought his batwing a superior form of accommodation and used it most of the time. I reckon there would be few, if any, who would agree with him now. Sometimes he would tuck himself into a horizontal cleft below a rock overhang, in one
instance part way up a cliff, and so there were concerns about rolling over and dropping off during the
night. Usually he just set up camp in the bush. And for nearly 40 years he was in and out of the southern
valleys, spending a particularly long period in the Waiatoto, a few kilometres south of Haast, for which I
have especially fond memories, as much of my whitebait research in the 1970s was based in that river.
And that being so, we encountered some of Douglas’s charming descriptive names for many of the
streams – each day we would clear fish traps in streams called “Hubbub Torrent,” “Gliding Rivulet,” and
others – names typical of Douglas names that occur all over South Westland. I often wondered what
“Brewer Water” meant, but maybe it was called that because its water had the colour of beer.
Knowing a bit of Douglas from reading, and from working in the area, I got to wondering what he used
to eat. Not only was he typically a long way back into the mountains, but even when he came out there
wasn’t exactly a ‘supermarket’ to buy his tucker from, and he faced all sorts of logistical problems as a
result. Which reminds me of one comment about Douglas – people often did not know how long he
had gone into the hills, and so tended to not know when to expect him back. And it could be weeks.
It is not hard to imagine that people he connected to sometimes wondered whether he was okay, or
had fallen into a crevasse, or had been swept away in a flooded river. And so they estimated how long
he planned to be away, by how much tobacco he took, as a better measure of the time he would be
away than how much food he took. Partly, of course, this was because Douglas would gleam a lot of his
food from the forests and rivers, to supplement such basics as flour, tea, salt and sugar with him. If he
could find birds to eat, he managed to keep himself alive – as long as he had tea, sugar, and flour, and of
course, plenty of tobacco.
These sorts of concerns about Douglas’s safety raises another issue. Drowning became known as the
“New Zealand death” in early colonial times, as week after week men were swept away by the river flows
drowned, many of them never seen again. Douglas couldn’t swim and was known to argue that
this often prevented him from drowning. Sounds Irish, doesn’t it, but there was some canny Scottish
wisdom there – because he couldn’t swim, he tended not to put himself in circumstances where he
might have to!
Douglas found all sorts of things to eat. Basically, as was true of most of the early explorers, flour formed
the basis for his food, sometimes also oatmeal and rice. But you do have to wonder how Douglas kept
flour dry – no plastic bags then. Some of what Douglas found to eat would today give conservationists
the ‘dry horrors’. One of Douglas’s staple foods was kakapo, which were abundant in the bush then.
Douglas typically had a dog with him, usually some kind of border-collie cross, as he had little time
for pedigrees, and there are some fascinating stories told about him and his dogs. One story has one
of the dogs routinely bringing in three kakapo – two for Douglas’s dinner and another for the dog
– undoubtedly apocryphal, as I’d be surprised if dogs can count and, even if they could, it is hard to
imagine the dog stopping just because she had three! Moreover, Douglas remarked at one point about
getting up in the morning to find that Topsy, or Betsy-Jane (it seemed that he had several dogs with
these names) had brought in a dozen kakapos from the bush overnight, though “they are not very fat,
but good enough for soup”.
Sometimes Douglas would catch eels and one of the best stories about this man relates to him going
eel fishing. I think in the lower Waiatoto River, with Gerhard Mueller, another 19th century colonial
surveyor in South Westland, and with whom Douglas spent a fair bit of time. As written by Mueller, the
story goes: “That afternoon we went exploring a Branch of the River and, as we only had flour and no
meat, we kept a sharp lookout for eels. Douglas had a hook with the barb filed off, which he fastened
to the end of a long stick…Well, we saw a hummer of an eel and fastened on and got him safely into
the canoe and tomahawked him (her, actually – all big eels are females). The second one we spied was
nearly four foot long and Douglas was frightened to gaff him – however, we thought we (should) risk it,
more especially as we had an outrigger at one side of the Canoe. Well, we hooked him, and the fellow
gave a horrible pull, nearly sending Douglas headlong into the River on the outrigger side. He naturally
leant to the other side to save himself, which brought the outrigger 3ft out of the water and the Canoe
half filled. To save us getting swamped, I put my full weight on the outrigger and over we went with
such force to take in a barrel or two of water on the other side. However, Douglas stuck to his game and after much heaving and struggling, landed the fellow in the Canoe where, owing to the quantity of water, we had more difficulty tomahawking the chap. That done, we had half-an-hour’s work bailing of the canoe.”

That was not the end of the day’s fishing, as further up the river they tackled another one… “Well, Douglas ran the gaff through him four or five inches from the end of the tail and then threw the paddle for me to make for the shore while he held onto the pole like grim death. As soon as we landed, I jumped out and took hold of the pole while Douglas hurled boulders double the size of your head. He was an awfully big one and in his contortions he broke the pole, and there was a great danger of him escaping. The three Eels together weighed about 70lb“.

And, later, again on eels, he wrote: “Then the Eels! Ye Gods, think of them. Not the bull headed, black backed whiskered Vagabond that tastes like subextract of bog water and is palmed off on a swindled public as an Eel, but the long elegant formed light coloured Silver Eels: a fish that eats like Salmon and is only found in large, clear running streams, never in Lakes or bogs, or lagoons. Prejudiced people have… shuddered at the very thought of eating such water serpents, but in a week or two they went back full of Eel and gratitude, confessed they had discovered a new pleasure, and left the place with regret…”

Writing generally of eels, and discussing the side they could reach, Douglas thought that “the number of eels of immense size that I have been seen or hooked in Westland is something wonderful, and it is strange that I have never hooked any of the serpents, and I am doubtful of their existence. Fishermen in all countries are notorious for embellishment, so all eel stories must be taken with a grain of salt… The record eel is apparently in Lake Brunner; he has been seen but never caught. Two Italians went out one night with extra strong tackle determined to catch him, for weary hours they waited enduring the mosquitoes with exemplary patience, till at last there was a tug at the line and the battle commenced. A half turn was taken with a line around a tree and inch by inch, the monster was slowly hauled ashore on a sandy beach. Then the Italians dropped the line with a howl of terror and fled. They said it was either an eel or the devil, they wouldn’t be sure which it was. What the monster’s length was they couldn’t say as there was only eight or nine feet out of the water, its eyes shone in the darkness with an awful reddish yellow glare, and its mouth when opened was large enough to take down a stable bucket… Had the Italians picked up courage next day, they would have found their line all right, but attached to a snag or bungay fern. The goggle eyes and the awful mouth were mere details made up on the flight home.”

One of the other people that Douglas spent a lot of time with in the mountains was Arthur Harper, a well known mountaineer from colonial times, as well as a Christchurch lawyer, and descendent of Bishop Harper. Harper seemed to have a need to skive off into the bush, from time to time, and spent a fair bit of it with Douglas. What Harper makes clear is that Douglas was a “very lovable character – a courteous gentleman of the old school – always maintaining the high ideals of that much misused word”. Reading between the lines, it seems likely that at times Douglas was also probably a bit of a drunk and perhaps keeping into the mountains was a way of avoiding problems deriving from that. Harper relates: “He and I roughed it unspeakably for two years (and let us remember that Douglas did it for decades without Harper), but I never heard him use an expression or tell a story which would have offended a lady – even of the Victorian era”. Harper then related the “one occasion (the only occasion) he lost his temper, and while his language might have been deemed unsuited for polite society of the Victorian era, I am not sure it would be today!”

“In teeming rain and a howling gale (we) were making a poor shelter under a rock… and only had a little flour and suet, having got no birds that day, so Charlie began to make some ‘doughboys’. He turned a tin plate upside down on his knees, and began to cut up the suet on the bottom. The pressure of the knife bulged the plate in and when the pressure was taken off the suet flicked into the air (as the plate popped out again, and of course the suet was spread all over the ground). Charlie got impatient, and cut harder and harder, and ‘flick-flack’ went the plate and off went the suet! At last he lost control and said: ‘Ter hell’ – away went the plate over his shoulder – ‘with such a berluddy’ – away went the suet over the other shoulder – ‘country’ and the flour followed the plate and suet into the rain and darkness. He
then lit his pipe and said laughing: ‘Aye-he I suppose we’d better pick them up again.’ It took some time to find them.”

Early in his career, Douglas and two mates were once sitting round the fire, basically out of food and had been for some days. The story goes that one of them pointed to Betsy and said: “I’m afraid that we will have to … and I knew what he meant. Of course, Mr Douglas could not kill her, so I said I’d do it, and I stretched across and put my hand under her. But she was skin and bone … so nothing more was said.” Or done. The next day they heard a kakapo screaming across the slope and with Betsy’s help they got it. “Douglas cut it into four exact bits and cooked it, but it did not go far! And Betsy ate the rest”. Despite depending on birds substantially as food, Douglas evinced a distinct affection for them, perhaps because they were so often and for so long his only company, and he is said to have lived on dry bread for days when he knew the birds were nesting. He wrote that “If people travelling in the wilds would only shoot what birds they actually want, & not go blazing away … the murderous instinct is still strong in man. The law won’t allow us to gratify it on each other, so we relieve our thirst by slaughtering dumb animals”.

Working so often alone, he had real problems packing his gear and food into the backcountry – there were no economies of billies and compasses, etc. and he had to carry everything himself. Often, there are reports of his ferrying gear up river valleys, going back for second and even more loads, so that he could build up some stores near where he was working. Standard rations for those days were listed as “oatmeal, milk, rice, tongues and beef (tinned), bacon, onions, potatoes, tinned peas and beans, cheese, sugar, salt, cocoa, jam, pepper, pickles, sago, tea, apples, flour and soap” – seemingly quite a diverse array of items, but you’ve got to remember that he had to carry these, often by himself, and he was routinely away in the mountain valleys for weeks at a time, alone. And he had to cook them in a billy on a fire. So, clearly, he had to find much of his tucker from the bush. If he was planning to be up a river valley for some weeks, he would spend time preparing staging camps and would run several trips upstream with a supply of food and other items to last for the needed time – and mostly by himself. He obviously enjoyed his own company, as long as he had a dog. He depended heavily on birds – not just kakapo, but also weka and pigeon. “Bread & Jam is very good no doubt, but not the thing for swagging”, he wrote.

When heading up into the Waiatoto, his plan was to spend six months there and he took stores for this time and would “punch them up” as far as needed for the survey in hand. Sometimes he had the use of a canoe, which he called “The Surveyor General” – revealing some of his attitudes towards the bureaucrats for whom he worked. He found one of the advantages of a dugout canoe was that it “tracks just as well bottom up as the any other way”. And at one point: “Punching up remainder of Swag, what a weary heart breaking thing it is, staging swags going over the same ground twice or thrice. A man to be fit for this Mountain Life has to be able to pack like a Mule, or else live on air.”

Later, Douglas reports: “I am so sick of staging that I put them both (swags) in one and crawled up to within a Mile of the Forks, where I camped for the night; one comfort, I am among the birds again, pigeons and Kakapos are fat, and tomorrow I be among the hens (wekas), it makes a wonderful difference in the Flour, having birds.”

Douglas’s writing, mostly surviving in letters, is full of droll and often pointed comment. Once, he was drawing the mountains (he did this a lot as part of his survey) and encountered a couple of keas. “I was sitting sketching with my back against a rock, as is usual, when finished I held it at arm’s length to admire my handiwork, when in that mountain Solitude I was startled by a Yell of derision. Looking up, there were two Keas peeping over my shoulder with their head cocked to one side….I held out the sketch for them to admire. One came hopping along with its top knot up & and one eye closed to examine it. He looked first out of one eye, then the other, gave his mate a dig in the ribs and gave vent to a Yell that brought Keas around in dozens. What they thought exactly I don’t know, but they evidently had a very poor opinion of my talents.”
Spending a lot of time around bush streams and wetlands, Douglas became familiar with a number of stream fishes, including the giant kōkopu, New Zealand’s largest species of Galaxias. He regarded this as an “unholy looking fish (that) is common all over the country wherever a bog hole or deep bush creek exists….from their appearance they have no business to be alive on earth now a days; their proper location is as a fossil….it is a wicked looking fish, there is not the slightest doubt as ‘they prefer the darkness rather than the light’. They haunt box drains like evil spirits….and if one could only get down a coal pit, the fish would have reached the height of Cock-a-bulla felicity….They are very easily caught with almost any kind of bait, but as an eatable fish they are not the kind to get excited over. Still, they are not so bad when nothing better is to be had.”

Douglas was well familiar with the now long extinct, native grayling (see article in Issue 22, 1998). Douglas thought it “every bit as good as the Home trout and sometimes twenty inches long, they don’t swim in dozens, but in shoals of thousands”. He ate kiwis, at times, but regarded them as “needing considerable practice to get the acquired taste.”

“They have an earthy flavour which to many would be disagreeable. The best definition I have heard about roast or boiled kiwi, was a man, remarking it tasted as he would imagine a piece of pork boiled in an old coffin would be like. The egg has slightly the same flavour, but is not to be despised. One egg makes an excellent fritter, covering an ordinary frying pan.”

So, as we explore what Douglas found to eat in the remote forested valleys and snow-capped mountains of the western slopes of the Southern Alps, we find him using the bush and the rivers as a primary source of meat foods, eating species that are extinct, or which are so close to it that millions of dollars are being spent, year after year, to try to save such species – not that their plight has anything to do with Douglas killing and eating them. I’ve mentioned just a few of them, and we should not be surprised to find that Douglas ate pretty much anything that would swim, run or fly – pukeko, grey duck, paradise shelducks, brown teal, wekas, shoveler all found their way into his pot. Kaka he found in autumn to be very fat and good eating. But, when it comes to shags, he thought them “a bird that no white man would eat if he was starving, and for any purpose except baiting an eel pot.” There would probably be few who disagreed with that!

Colonial literature is full of these sorts of stories – the topic of a forthcoming book!
3.10 Cecil Whitney – the ammo man

Fish and Game 55, 2007

R M McDowall profiles Cecil Whitney, a man ranked as one of the stronger characters among many strong characters who made a distinctive, if not always helpful contribution to game shooting and trout angling in New Zealand.

Older game shooter and hunters will probably remember the time when ammunition available in New Zealand was virtually all manufactured by CAC – the Colonial Ammunition Company, of Auckland. Some, also, may recall the “Ammohouse Bulletin” that was published for a few years by CAC as an advertising/information magazine, issued several times a year, with some interesting tidbits of information about game shooting and freshwater angling.

The Colonial Ammunition Company was founded by the Whitney family (details of which can be found in a chapter of Bill Sullivan’s history of the Auckland Acclimatisation Society, called “Changing the face of Eden” published some years ago). The Whitneys were Scottish immigrants who arrived in New Zealand in 1888, and they began their business supplying ammunition to New Zealand troops, at a time when Russia was expanding eastwards towards the Pacific shores of northeastern Asia, and it was realised that all of New Zealand and Australia’s ammunition was being manufactured in the Northern Hemisphere.

In addition to their commercial interests in ammunition, the Whitneys were also very active in the acclimatisation society movement in the northern North Island. It was Cecil Whitney, son of the founder of the business, who was much the most active, being a member of the AAS Council, on and off from 1891 to 1932, was elected a Life Member in 1916, and eventually became President in 1926-1828. Sullivan describes Cecil Whitney as a very ambitious and strong-willed man accustomed to having his own way. He was seemingly an autocrat who “nearly tore the Auckland Acclimatisation Society apart, not only once, but twice” – so as to provide him with the opportunity to run a new society according to his own desires (it never happened). At one stage, in 1911, he resigned from the Auckland Acclimatisation Society, having everything in place to launch the “Waikato Acclimatisation Society”, with even appointment of the Governor of New Zealand as patron. When this failed, Whitney was instrumental in having individuals he favoured elected as Society President, and it seems became something of a de-facto president until he could manipulate his way into positions like Deputy Chairman (a new position invented for him), Vice-President, and eventually President – only to find himself facing schism from the same Waikato sportsmen that he had tried to organise more than a decade earlier. Sullivan reckoned that Whitney treated the society as his personal possession to do with as he wished, expecting everyone to carry out his wishes. Clearly, we are dealing here with a strong personality, but neither more nor less than seems to have been a characteristic of the New Zealand Acclimatisation Society Movement throughout its long history. Included amongst the somewhat subversive activities that Whitney ‘got up to’, when displeased with the Auckland Society, was to recommend to the government that it should assume control of the Rotorua and Taupo fisheries, which is exactly what happened.

More important, now, though, is to explore the role that Whitney had in establishing fish and game species for the exploitation of hunters and anglers.

Little-known and/or long forgotten was a role that he had in getting rainbow trout stocked in Lake Taupo. The Auckland Society discussed a proposal to stock Taupo, but the Council demurred, thinking the lake was beyond the reach, and therefore outside the interests, of Auckland anglers. Getting there was, of course, a much more difficult proposition than it would be now and, as brown trout were well established there, anyway, ASA initially rejected the proposal. Whitney thought differently, and with his personal wealth the lake was much more accessible to him, so he offered to underwrite the costs of getting a batch of rainbow eggs or ova to Taupo. True to his word, Whitney made arrangements for the transport, with the Rotorua Motor Coaching Company picking up the fish from the train to Rotorua and transporting them to Taupo, where they would be distributed around the lake and its tributaries.
Whitney’s name seems to have inappropriately disappeared from accounts of the establishment of rainbows in Taupo.

Some of the best insights into what sort of man Whitney was can be obtained from reading articles and letters he wrote to an early outdoors magazine, New Zealand Fishing and Shooting Gazette. I found there some of the most turgid prose I have ever read, with, in one of Whitney’s efforts, sentences 180, 147 and 140 words long. It would be quite fun to present one of them but it would consume too much valuable space! With the tiny print in the magazine, one ends up almost dizzy trying to understand the man. He wrote voluminously and rather pompously on several themes.

It was perhaps on the basis of his Scottish origins that Whitney became a commentator on matters relating to Atlantic salmon. When the species did, finally, become established during the early decades of the 20th century, the populations turned out to be landlocked and restricted to Lakes Te Anau and Manapouri, and the upper reaches of the Waiau River, in Southland. Once it became clear that they were reproducing, there was prolonged debate about whether they were anadromous (sea-migratory), or not. Whitney became involved in the debate from the isolation of Auckland, though he did visit and fish in the lakes, and was adamant that they were anadromous largely, it seems, on the grounds that they came from anadromous populations in Great Britain, and that they could not do anything different in New Zealand. He was wrong. He was equally adamant that the same was true of rainbow trout, claiming that “For 15 years or more it has been known that the rainbow trout were going to sea and returning to the Waikato [River] to spawn”.

He was wrong again. He went Chinook salmon fishing in the Rakaia, and even argued for an Atlantic salmon being caught there. And he pontificated at length on how the fish pass built into the newly formed dam on the Waitaki River, at Kurow, could and must be made to function. He described elaborate plans for wire netting guidance panels and motorised lifts for lifting fish over the dam. It never happened and the fish pass was an enduring failure.

Whitney wrote a series of passionate appeals about the need for additional foods for the trout in Lake Taupo, with proposals for a massive koura (freshwater crayfish) hatchery. Should this not eventuate he generously suggested that the local Māori communities would prefer to be paid for koura they caught from the lakes, rather than eating them, though they were presumably not consulted! He thought that “there would be no difficulty in transporting the koura by the 100,000…if carried in fish cans, each would hold tens of thousands.”

Some of Whitney’s other ideas were even more bizarre. He wanted inanga (whitebait) hatcheries, too, that would be used to provide food for the trout, calling for experiments: “in the breeding of billions of inanga’ as trout food. As with the koura, he was hopeful, if the Māori s could be dissuaded from eating the “galaxia” in the lakes, that they would “increase in leaps and bounds [to] thousands of millions of them in the lake”.

He wanted “galaxia” liberated in the upper reaches of the rivers flowing into Taupo so that “the trout will begin to run up the rivers earlier and earlier to obtain food [how would they know?], even if plentiful in the lake…I am afraid they will never become plentiful in the rivers as they used to be until they are obtained from other sources and are liberated as far from the lakes as possible”.

And as with koura, Whitney suggested that Māori s catching “galaxia” around Lake Rotorua “would much prefer cash instead of eating them. Hundreds of thousands could in this way be transported every year to Taupo”.

Another, even more inspired, suggestion was that brown trout fry could be hatched and liberated into Taupo as food for rainbow trout.

How all these plans were to be funded was never mentioned, though Whitney did state that had Premier R.J. Seddon lived a little longer, he was committed to making the hatcheries possible. Who knows how much all this would have cost?

With their Scottish ancestry, it is perhaps no surprise that the Whitneys were also interested in the establishment of upland game birds like grouse, partridge and woodcock. Cecil evidently brought some
partridge in at his own cost, and liberated them in the Waikato, though as has been true of almost every upland game species brought to New Zealand, they failed to become established. He thought that the Department of Internal Affairs should be liberating 7000 pheasants a year.

It was ducks, however, that would provide Cecil Whitney with the sort of result that he wanted. The Auckland Acclimatisation Society had growing concern about decline in the numbers of grey ducks available, and had attempted to enhance the populations by captive rearing and release. This bird proved intractable and captive reproduction was largely unsuccessful. So the Whitneys introduced some largely domesticated stocks of mallards, at their own expense, from Great Britain. Though these seem to have been easy enough to rear in captivity, they had apparently become so domesticated that they provided no significant quarry for game shooters. So Cecil Whitney, as seems to have been his habit, again attacked the problem with his own energy and finances, imported some North American mallards himself, at one stage proposing annual introductions of 20 pairs to strengthen the populations. He was involved in quite prolonged and extensive captive rearing himself, and organised for others to undertake captive breeding and release, by providing the eggs. He produced over 1000 ducks in 1941 alone, so this was a quite substantial business based at the Whitney's estate in the Waikato. It seems that the stocks of mallards obtained by Whitney are the ancestors of the mallard ducks that are now the dominating bird sought by duckshooters in most parts of New Zealand. Sullivan described the mallard as "a colourful, living memorial to Sir Cecil Whitney who loved this beautiful bird and had the foresight and determination to introduce it for all sportsmen in the Auckland Acclimatisation Society area" and of course elsewhere in the country. Whitney imported fresh stock in 1938-1939 and continued to make imports even during the Second World War. Not satisfied with just assisting with bird imports and stocking, Whitney also obtained seed of wild rice and wild peas to grow as food for the growing wild populations of mallards in the Auckland-Waikato area. As with pheasants, he generously suggested that the Department of Internal Affairs should also rear and raise 5000 ducks (per year!!).

His promotion of mallards brought Whitney into 'head to head' conflict with Edgar Stead, of Christchurch, a North Canterbury Acclimatisation Society Councillor, and distinctive among leaders in the ASM with regard to the need for native bird conservation (see an article on Stead in Fish & Game New Zealand, Issue 56). Stead believed that the mallards competed and ousted the grey ducks and, moreover, that they hybridised with the grey. Whitney was adamant that this was untrue, and there is what might be described as 'robust' correspondence in the Christchurch newspapers on the question. There are also hints that Whitney may also have been writing letters under the nom-de-plume R.E. Whitney even had a notice printed in New Zealand Fishing and Shooting Gazette, offering a reward of £10 to the first person who sent a mallard/grey hybrid to the Wellington Acclimatisation Society. Whitney named Tom Andrews, a Wellington Society ranger, as one of the people who could be trusted to make this identification (see an article on Andrews in Fish and Game New Zealand, Issue 43). Stead's concerns about hybridisation were shared by others, and the Department of Internal Affairs undertook a survey to assess the question. The outcome did not suit Whitney's prejudices, and so he accused the people conducting the survey of only talking to people who favoured grey ducks. As well, Whitney even failed to persuade the Council of his own acclimatisation society, which shared Stead's fears of the impacts of hybridisation, which voted against continued mallard imports. That Stead was right and Whitney wrong (again), is endorsed by history.

There are some additional quirks to Whitney's long life. When attending the New Zealand Acclimatisation Societies' meeting in 1912 he strongly supported a war on hawks – and in this regard the Auckland Society was one among many who did so – except that one could, perhaps, accuse Whitney of having a conflict of interests, as it would partly be his CAC ammunition that was used to kill the hawks. History shows that there were few areas that could foot it with the Auckland Society when it came to killing hawks – between 1922 and 1942, the Society paid out bounties on nearly a quarter of a million, including 17,000 in 1931 alone. A distinct oddity in Whitney's proclamations was his agreement with a suggestion that kingfishers should be shot, owing to a belief that they destroyed a large number of trout – Whitney arguing this on advice from some un-named individual who, nevertheless, had "impeccable credentials". He found few who agreed with him!
His connections in the ammunition industry proved beneficial for both hunters and the Auckland Acclimatisation Society during the Second World War, as the government decreed that there would be no ammunition available for recreational hunting, for fairly obvious reasons. This had the potential to not only deprive hunters of their sport, but more importantly, in some ways, if there was no ammunition, hunters could not go duck shooting, and the Society could not sell any hunting licences. So a 'no-hunt' season could have been financially crippling to the Society, which had ongoing expenditure for staff and other functions. Somehow, Whitney arranged for a seemingly liberal supply of shotgun cartridges to be made available to Auckland hunters.

Several honours came Cecil Whitney’s way. He was elected a life member of the Auckland Society in 1916, and was knighted in 1946. He seems to have long served as a supernumerary member of the Council. He resigned from this role in 1948 having been involved for over 50 years, 32 of them as a Councillor, and he died in 1954, aged 93. He can, with confidence, be ranked as one of the stronger characters among many strong characters who made a distinctive, if not always helpful contribution to game shooting and trout angling in New Zealand.
3.11 Wise before his time

Fish and Game 56, 2007

R M McDowall profiles Edgar Stead, who long ago became involved in national controversy over the effects of introduced mallard ducks on the native grey duck. Stead also led the charge against importing beavers as well as Scottish heather, had strong views on possums, successfully lobbied for the protection of shags, and generally was a somewhat contradictory fellow who sought to find a balance between exploitation and conservation.

If you visit the staff club of the University of Canterbury in the spring time, you will encounter the most glorious display of azaleas and rhododendrons, particularly azaleas. The staff club is in Ilam Road and the building was formerly the home of Edgar Stead, where he had a property of some 20 hectares, known as “Ilam” in what would, in the early 1900s, have been the outskirts of Christchurch.

Stead was internationally famous for his azaleas, but that was only one of the several strings to his bow. Of more interest to sportsmen would have been his involvement in angling and hunting. He was (and still is known as) an early 20th century ornithologist and was also a member of the Council of the North Canterbury Acclimatisation Society for some years. He was, of course, only one of hundreds of often busy men who were ASM councillors, but I am discussing his role here for a specific reason.

As you read through the minutes of the New Zealand Acclimatisation Societies Association (recall an article on Leonard Tripp who was chairman of this Association for almost its entire existence – see Issue 40), you will find, as I did, that the things that Stead stood for are distinctive and individualistic, especially when seen in the context of the New Zealand Acclimatisation Societies Association as a whole.

Stead was a persistent champion of the conservation of bird life, among a majority of councillors whose chief concern could be said to be ensuring that there were enough trout and salmon to catch and ducks and upland game to shoot. Sometimes this concern was nevertheless at the expense of native fauna.

Stead’s father was a successful local Christchurch merchant, owned racehorses, and left his son well endowed, so well-endowed that he did not need to work. Edgar was schooled at Wanganui Collegiate and then did a degree in electrical engineering at the University of Canterbury, but after several years working at an American research laboratory, Edgar returned home to a life of some leisure, spent mostly growing azaleas, exploring bird natural history, game shooting, and trout fishing. His bird studies can be found as published papers in the Transactions and Proceedings of the Royal Society of New Zealand, in a book on the life histories of our birds and he also influenced the writings of another wealthy amateur ornithologist, R.A. Wilson.

Much of Stead’s leisure time, and it seems he had plenty of this, was spent becoming a skilled angler and world class game and trap shooter. It seems to me that for some years, Stead had an important role when attending meetings of the New Zealand Acclimatisation Societies Association (representing the North Canterbury Society). His role was quite distinctive as his interest in birds and their conservation emerges quite strongly through his apparently conflicting interest in shooting all sorts of winged game.

Stead is shown, in [North] Canterbury Acclimatisation Society Annual Reports, as having purchased licences for game shooting from as early as the 1901-1902 season. He bought angling licenses from 1904-1905 and was still buying licences as late as 1942-1943 (when the annual reports ceased the listing of all licenceholders). He became a member of the Council of the [North] Canterbury Acclimatisation Society in 1912-1913, was the Society’s Chairman from 1924-1926, and the Society’s annual report in 1948-1949 records Stead’s death and pays tribute to his contribution to ASM matters.

Stead’s first mention at the NZASA meetings was by means of a letter he had written and which was read by the [North] Canterbury delegate at the 11th meeting in 1913. Stead himself attended the 12th and then all NZASA meetings until the 15th in 1927. He was clearly a man of considerable personal confidence and rapidly made his presence felt at the NZASA meetings, raising some issues that might
seem, to many anglers and game shooters, to be somewhat peripheral to acclimatisation society functions, occasionally tackling President Tripp head on. There were several recurring themes in his utterances at the meetings.

In his 1913 letter, Stead pressed for an open hunting season for dotterel “until such time as New Zealand Societies make arrangements with Australian Societies to have dottrel (sic) protected”. This was a theme that he pursued, meeting after meeting, at the 1920 meeting suggesting that the hunting seasons for dotterel “should be concurrent in Australia and New Zealand – what was the point in protecting them in New Zealand if they were being hunted in Australia”.

He was at it again at the 1924 meeting, and yet again in 1927, reckoning that thousands of dotterel were “available in the North Canterbury district…[and he thought it] unfair to breed these to have them shot by Victorian sportsmen…they could be seen hanging in strings in any poultry shop… where pot-hunters were killing hundreds at a time. Protection, here, was [he thought] wasted”.

He was clearly interested in having a variety of game to hunt, suggesting in 1920 that one or more species of plover should be introduced (for hunting) and he proposed an open season on several migratory plovers, godwits, and other birds (on the basis that they did not breed in New Zealand, so why not shoot them here, which is an interesting attitude, given his comments on Australians shooting dotterels). Stead raised this again in 1927, asking for an open season for Eastern golden plover and turnstone at the same time of the year as the open season for godwit and knots.

He became involved in national controversy over the effects of introduced mallard ducks on the native grey duck. The grey was declining in number and Stead clearly thought that the grey was “incomparably the better bird”. Stead attributed decline in greys, in part, to hybridisation with the invasive mallard and at one stage was involved with shooting any hybrid birds in the Avon River in Christchurch.

Stead had been advised that the mallard was “pugnacious, a murderer of young grey ducklings, a worrier of the grey, and that it interbred with every class of duck”.

These allegations brought Stead head to head with Cecil Whitney (see The Ammo Man, Issue 55), who was primarily responsible for the importation and establishment of mallards – breeding them in captivity, providing eggs and/or birds to various acclimatisation societies, and liberating them in large numbers in the Auckland/Waikato region. Interestingly, in an investigation of attitudes towards mallards in the South Island, Whitney found that it was primarily only in North Canterbury that there was opposition to the greys, implying that it was Stead who was the problem, and Whitney was probably correct.

Another of Stead’s interests was in getting upland game established and so he became involved with some moves to import partridges. He soon changed his mind, however. Having formerly favoured importation of partridge he later “did not anticipate anything but poor results…” He thought that “the Francolins were the best birds to import”.

There were associated NZASA proposals that Scottish heather should also be introduced, to improve habitat for upland game, but Stead demurred, claiming that “our mountain tops would be covered exclusively with Scotch heather if it were planted” and he advised the Association to “pause before taking action”. What actually eventuated is unclear, though heather was imported by someone, as it now forms a significant part of the vegetation across the Desert Road in the central North Island – we have the heather but not the upland game!

It was not only heather that Stead was against. With some wisdom he opposed the importation of beavers, or other fur bearing animals (this had been suggested at the previous NZASA meeting), wanting to see Fiordland devoted totally for the protection of native wildlife. Viewed from the year 2003, this is not all that surprising, but we need to recognise that Stead was commenting 75 years ago, when knowledge was not nearly as well developed as it is now, nor had New Zealand naturalists learned about how damaging some introduced species may be.

There was a strong, and I think wise, conservation theme in much of what is reported about Stead’s contributions:
• he argued for appointment of a caretaker on Kapiti Island
• recognised the need to protect white herons from shooters
• suggested, too, that milling of forest around Okarito should consider the need to protect the colony of white herons nearby
• reported on the return of the “mock-a-mock”, or bellbird, which he said had not been seen around recently
• wanted total protection for black teal.
Again, none of this seems all that unremarkable – in 2003.

Predators captured his attention, too. At the 1920 meeting, for instance, he:
• expressed concern about the effects of possums, fearing that they would lead eventually to the extinction of the kaka, in addition to the damage they cause to native forest (and in this regard Stead was distinctly prescient, in the sense that in just the past year or two we have been surprised by video-film showing nests of some threatened birds being raided by possums!)
• spoke of the destructive habits of hedgehogs, especially their impacts on wekas
• repeatedly sought a government bounty on stoats and weasels in areas where there were not infestations of rabbits – describing the protection of stoats and weasels as “absolutely ridiculous”.
Moreover, he claimed (somewhat speciously, I suspect) that in his district “there were occasionally more weasels than rabbits” and that “he had found 60, 70, and 80 eggs in the larders of weasels and they should be shot out to prevent the extermination of native birds”.
In addition, he showed considerable wisdom in arguing that rats are the worst enemy of native birds and, moreover, he thought that stoats did not attack rats – as in “his backyard the stoat and rat lived in harmony.”

He moved that the government be asked to remove protection from grey owls as they were “doing away with fantails” and he wanted something done about magpies, which he thought were “the enemy of native birds, would kill small birds, and eat their eggs” (while admitting that tuis would do the same).
His attitude towards shags was interesting – especially in light of the ongoing debate about the need to cull shags (see “Stop Slagging the Shag” in Issue 38, and correspondence on the subject in Issues 40 and 41). At the 12th meeting of the Association in 1915, long-term NZASA president Leonard Tripp suggested that “protection of all shags [should be] absolutely removed”, but Stead retorted that it “would be a disgrace to the Conference if this were carried” and it wasn’t. Stead claimed that New Zealand’s shags “represented a gradation in species unique in the world. The only one that did any damage was the big black shag. The pied shag only came inland in small numbers. The shag was the sole natural enemy of the trout and should not be altogether exterminated. Many streams were overstocked and the fish in them were hopelessly small. This was due to the interference with nature’s balance and there was no reason why protection on all shags should be removed”.
Stead would return to this issue several times, as there were continued moves to remove protection and Stead was supported strongly by the country’s leading contemporary ornithologist, Robert Falla.
At the 1929 meeting of the NZASA, in his usual meeting ‘Presidential homily’, Leonard Tripp canvassed the question of predators, and the meeting minutes report that he stated: “There was the question of shags, for instance. Each had his own idea of the shag, and of course, Mr. E. Stead held that no shags should be shot (laughter). He would not say whether he was right or wrong, but he would take him to a stream in Canterbury where since the shags had come in the trout had gone out”.
Stead commented on diverse other issues during his ASM years, but, to me, the interesting thing about his contribution to fish and game matters was that he sought to find a balance between exploitation and conservation and, in this regard, I think Stead was a distinctive person for his time, who made a notable contribution.
3.12 Brunner’s epic bush bash

Fish and Game 57, 2007

R M McDowall profiles Thomas Brunner, a man “of endurance, fortitude, pluck, and just downright gutsiness”, renowned for his epic 19th century pioneering explorations around the South Island. Read this carefully if you think a night or two out in the bush is tough today.

New Zealand is not noted for making its citizens heroes, unless they reach the South Pole, climb Everest, are leading All Blacks, or win the America’s Cup. But some published anthologies, like Nancy Taylor’s “Early Travellers in New Zealand” (published in 1959), include accounts of notable explorers of our countryside at a very early colonial period. And several of these men have been celebrated in interesting television series. But, even so, we don’t seem to revere New Zealanders in the way that Americans recognise Lewis and Clarke for exploring across North America to the Pacific Coast, or Australians Wills and Burke’s famous journey across Australia. But, if we were to dig a little deeper, there are some really remarkable people in New Zealand’s history, who deserve our admiration, and this article celebrates some of the life of one of these: Thomas Brunner.

It is not as if his explorations have not been well published, and republished, yet I suspect he is not someone who would immediately come to mind were we to have a general discussion of early exploration.

A little familiarity with what Brunner achieved cannot but generate great admiration for a man of endurance, fortitude, pluck, and just downright gutsiness. At the risk of providing the end of this story at its beginning, imagine what it would have been like, in 1848, travelling up old Māori tracks through the forest along the Grey River, miles and miles from any kind of civilisation, to wake up one morning and realise you’ve had a stroke, leaving the whole of one side of your body paralysed and, lying in a crude tent, must listen to your Māori guides discussing whether they were going to stay with you, or give you up as a “lost cause”. That’s what happened to Thomas Brunner, whose name is remembered in Lake Brunner, in the Grey River valley, and the Brunner Range. Let me just finish this anecdote, and say that one of Brunner’s guides, named Kehu, remained faithful to him and, with a few days to recover and a fair bit of help from Kehu, Brunner got moving again and eventually found his way back to Lake Rotoiti, where he knew there was a colonial farmer, and from there back to Nelson where he could get medical help. And Brunner lived on for a good few years, dying aged 53, after a career as a colonial surveyor.

But let me go back a bit in this remarkable man’s life. He came to New Zealand from Great Britain in 1841, aged 20. Living in the Nelson area, he undertook several foot journeys of exploration in the area between Nelson, Takaka, the West Coast, along the Buller River, and south as far as Lake Parlinga, in far southern Westland in the mid to late 1840s, and so has to be very much seen as one of our pioneering explorers, foremost among many. The first of his journeys was with William Fox, later a Premier of New Zealand, and Charles Heaphy, famous as an early surveyor, well recognised as an early colonial painter, and eventually awarded a Victoria Cross for valour during some of the colonial wars. The first of Brunner’s trips, took him, with these other two, from Nelson to Lake Rotoiti, and then some distance down the Buller River (when Fox was lucky to survive being washed off his feet crossing the Buller River, and was nearly another casualty to what was widely known as the ‘New Zealand death’). Kehu was with them on this trip. A second trip by Brunner, Heaphy, and again Kehu took them around Golden Bay, across to the northern West Coast, and south as far as the Arahura River (just south of Greymouth). This was a distinctly difficult journey, giving them all sorts of trouble with cliffs and the tide, and they were often virtually out of food. On one notable occasion, after several days without a decent meal, they reported finding a dead pigeon and, when they had chased the rats away, cleaned it up and turned it into some kind of a stew – scarcely a gastronomic delight, but I imagine you grow less fussy as the hunger pangs increase.

But it is on Brunner’s third trip that I want to focus here. The surprising thing is that he took off again, from Nelson, only a few months after he had returned from the earlier one with Heaphy and Kehu. You’d
think he’d have had enough. All of these remarkable journeys were in search for land for the settlers, as it became evident that more was needed for colonists continually arriving and wanting to become farmers. In this last trip, Brunner was again accompanied by Kehu and another Māori named Pike, as well as, rather to Brunner’s surprise, the wives of both men. Brunner would come to regret the presence of the two women, who would become troublesome at times. But Brunner closed his written account of the trip, stating that he found Kehu “of much use – invaluable indeed...”; and to Kehu “I owe my life, he is a faithful and attached servant”. Bearing in mind the comments above about Brunner’s stroke, this was no exaggeration.

Brunner and his Māori guides spent 550 days travelling from Lake Rotoiti down the Buller River to the coast, along the coast as far as Paringa, north again to the mouth of the Grey River, and then, instead of retracing the original path further up the coast and then back up the Buller River, they went up the Grey, across the low saddle to the Inangahua River headwaters, downstream to the upper Buller, and then followed the Buller back to Rotoiti. Brunner comments at the end of his account that he had spent this entire time without hearing a word of English spoken (unless, I suppose, he got to the stage of talking to himself). And he expresses some surprise that he still knew how to speak the language – probably not seriously, but perhaps a little hyperbole to indicate just how long it had all taken. They started in early December, 1846, and got back in mid-June of 1848. It was a long walk that took a long time, but in a way that was the least of their difficulties. Firstly, the loads they had to carry were prodigious and included a substantial amount of additional clothing and boots, as what Brunner wore became utterly worn to shreds clambering around rocks, breaking through untracked forest, crossing innumerable streams, and by the time they got back everything was threadbare. At one point late in the journey, Brunner rather primly refers to having donned the last of his “unmentionables”. And he had long before moved into his last pair of boots and trousers. Late in the trip, Brunner boasts of having acquired the Māori ability to walk barefoot – a sign of how battered his poor boots had become. There was no prospect of re-provisioning on the trip and, apart from what they could carry, they could only have what food they could glean from the forests and rivers, or obtain from the occasional Māori village they encountered. And there were no such hamlets on the outward trip until they had reached the mouth of the Buller River. The size of their loads can be gathered from a list Brunner compiled, dated February 22, a couple of months after departing from Lake Rotoiti. He comments: “Packed away our huge loads, mine consisting of a gun, 7lbs. shot [doesn’t mention powder!], 8lbs. tobacco, 2 tomahawks, 2 pairs of boots, 5 shirts, 4 pairs of trousers, a rug, and a blanket, besides at least 30lbs fern root.” One might wonder how much else that he didn’t bother to list. And, of course, there were no ergonomic packs, Goretex parkas, light down sleeping bags, or lightweight waterproof tents. That day they managed a paltry two miles and some days the walking was worse, and the distance even less. There were even occasions when they made so little progress, or could find nowhere to camp, and so returned to the one they had just left. It is no wonder Brunner became discouraged.

When they did eventually encounter Māori villages, on a number of occasions the Māori s were little better off for food than Brunner and his party, though it is interesting to see the extent to which these West Coast Māori s were willing to share their limited resources with Brunner, Kehu, and the others. Brunner described such sharing as “the welcome of strangers”, one of the distinctive and very attractive features of Māori culture in early colonial history. In one of these villages, Brunner found that the resident Māori s had already recently given away much of their stored food to a visiting party of Pakeha sealers and were little better off for supplies than he was.

Going down the Buller, Brunner had a terrible time. We all know how it can rain, and it did, day after day, and, although Kehu and Brunner’s dog foraged for birds, there were often days when they had nothing. They fished for eels in the rivers and it seems that Kehu was aware of places along the river where he would expect to catch eels. But sometimes they didn’t find anywhere to fish, or the rivers were in such flood that fishing was near impossible. They carried no tent and had to take shelter under primitive canopies in the bush made from blankets, or overhanging rocks. And though in some parts there seem to have been Māori tracks, at times they found themselves clambering over big rocky outcrops,
through near impenetrable forest, and making only a mile or two in a day. They spent a lot of time sheltering from the incessant rain, as much time soaking wet as they tried to make progress, and almost as much getting a fire going and trying to dry their sodden clothes. They had a little Pakeha food, though you have to wonder how they could keep flour dry in those ‘low technology’ days with no plastic bags. Brunner had pepper that he managed to protect from the water and he comments towards the end of his account about how important that had been to increasing the palatability of their miserable diet. They ate almost everything that moved and some of what they shot or otherwise captured would cause Forest and Bird to become apoplectic.

Eels were a mainstay, as were wekas – both often abundant, easy enough to capture, meaty, full of fats, tasty, and nutritious. They tried freshwater mussels from Lake Rotoroa, spent a fair bit of time digging for fern root, which was a staple carbohydrate food of the 19th century Māori, and they also managed the occasional meal of what Brunner called ‘tī’. Thus was the root of the cabbage tree, which Māori long recognised as a rich source of sugars. Māori brought a species of cabbage tree with them from Polynesia. To use this, you had to dig the roots and then cook them in a hangi. “It requires an immense oven and to remain twelve hours baking,” wrote Brunner, so it was no easy meal.

On their way down the Buller on more than one occasion, they used a seine net that they made, about 30 feet long and four feet deep. Brunner does not tell us what they made it from, but it could have been either flax or cabbage tree leaves, or perhaps kiekie. What ever they made it from, it worked and Brunner tells of catching “about 50 good-sized fish called the upokororo or freshwater herring” – in fact the now extinct grayling. They caught them several times over the months, once catching 150, and it is unclear whether they carried the net with them, or made a new one each time. Sometimes they caught enough fish to be able to salt and dry them for later use (a technology that was well developed by Māori, apart from the salt, and, of course, they had to be carrying that). Sometimes everything they had seems to have been absolutely sodden from the rain and once their painstakingly dried fish became inedible as a result.

It was tough going. Just two months out, when of course Brunner would have had no idea how many more months he still had ahead of him, he noted: “I am getting so sick of this exploring”. He further wrote: “The walking and the diet both being so bad, that were it not for the shame of the thing I would return to the more comfortable quarters of the Riwaka Valley” (near Motueka). How, though, did he keep his notebooks dry? And just a few days later, he commented: “Consumed our last handful of flour to thicken a pot of soup.” Again, you have to wonder how he had kept that dry.

And so they struggled on day after day, a little later writing: “Diet of fern root served out in small quantities twice a day. This was without exception the very worst country I have ever seen in New Zealand; not a bird to be seen; and the few fish there are in the river will not bite during rain or a fresh. We tried a species of the tree fern called kakote (but doesn’t say just what they ate), but it is far from palatable, and exceedingly indigestible.” And it had been raining for days. You really get the feeling that it was rugged going.

And Brunner had another 15 months, or more, of this ahead of him and, if he had known that, he would probably have been even more discouraged. His comment about the “worst country” is a really interesting one as it applied to the party travelling through native beech forest, where food for birds is very scarce, and the bird populations correspondingly sparse. This issue would come back to haunt Brunner, as many months later, on their way back up the Grey, Brunner’s Māori refused to take a track through another area of beech forest, arguing, and with some justice, that they would starve to death if they did. The problems with getting food affected them throughout the trip and one outcome of this was that, when they could get plenty, especially eels, Brunner found it impossible to get the party moving again. Or they had gathered so many eels that they could not carry them and so had to wait and eat some, or dry them instead.

Occasionally, Brunner’s Māori companions rebelled, and can you blame them? On March 16, he wrote: “…we are still here, and I am tired of urging our onward progress, for I only breed discontent… I am afraid to quarrel with the natives for I am told to look out for myself if I choose, and they will do the same.”

Sometimes they had plenty – of a sort! On April 18, they had garnered ‘about seventeen wekas, a dozen pigeons, a kaka and six crows’, the last of these being South Island kokako, now regarded as extinct. And the following day, Brunner tells that Kehu had caught “twelve eels, a sole (it would have been a black flounder), and a large trout, the
largest I have seen in New Zealand – I would say it weighed at least 2lbs”, and this would have been a giant kōkopu. He didn’t complain, like Māori often did, about how many bones the kōkopu has, but was just thankful for it. Clearly, they had plenty to eat for a few days. But it wasn’t long before Brunner was rather disconsolately writing: “Hunger again compelled us to shift our quarters in search of food, but finding none, I was compelled, though very reluctantly, to give my consent to killing my dog Rover. The flesh of a dog is very palatable, tasting something between mutton and pork.”

And, so they were constantly oscillating between plenty and famine. Mostly, it was fern root, eels, and wekas that kept them going. On June 4, and so mid-winter: “During the night the rats stole the provisions designed for our breakfast, so we had to start without one.” And a day or two later they reached the coast and had expectations of finding a Māori village because Brunner had been there before. But he lamented: “To be disappointed after three months’ anxious anticipation is truly vexatious…for on exploring this morning, we found two canoes, a wari (whare or hut) and a wata (whata, or food storage hut), but no provisions – so after many days and nights looking forward to a meal of potatoes (what luxury he anticipated), on reaching the coast we were compelled to eat the rimu or seaweed, instead. Yesterday I would have thought seaweed poisonous, or nearly so; now I eat it with relish.”

Having reached the coast, prospects for food improved and they had a more varied diet, with mussels and paua where there were rocky shores, and sea birds of various sorts. And so they made their way south, day after day, here and there reaching small Māori villages, where they were treated with the typical Māori generosity offered to strangers. And on July 30, one of Brunner’s passions was at last satisfied: “Came on to the pa Kararoa, and once again in my life enjoyed a hearty meal of potatoes!” And a little later, when at Taramakau, he exulted: “…feasting on potatoes…”

It might be a bit difficult to join Brunner with such pleasure from a plate of ordinary ‘spuds’, but I, and I imagine you, have never shared the previous privations these people had endured – not just the miserable and often intermittent food supplies, but difficult walking for weeks and weeks, undernourished and with heavy loads to carry, when keeping well fed might have made a huge difference.

They were on the coast for the whitebait season, when the ‘mutta’ were running, Brunner observed: “They are in such shoals that I have seen the dogs standing on the banks and lapping them from the stream.” Progress down the coast was slow and at one point Brunner commented: “My journal through the ensuing three months contains little except a record of the weather, and of little excursions I took to acquire a better knowledge of the country, and of the native habits and customs. They seem to have stopped for days at a time in various Māori villages.”

The party (though it was surely no party) eventually made their way south past Okarito, getting as far as Paringa, but not without other problems. Brunner badly injured a leg at one point, being swept off a rock by the tide, seriously spraining an ankle and suffering cuts and bruises. Perhaps it doesn’t sound all that serious, but when you’ve been struggling physically for a whole year, and have suffered bad nutrition and atrocious weather, it must have been demoralising. It was enough to make Brunner turn for home, though a week or two later he exulted: “December is a glorious month of dietary amongst the natives on the coast, as fresh fruit and vegetables are then coming into season. The rivers, large or small, abound in eels, hawera, upokororo (grayling), haparu (juvenile grayling), patiki (flounder), and parauki (smelt); the fruit of the ekiakia (kiekie) is then ripe, called by the natives tawara, and is very luscious, more like a conserve than a fruit; the honey of the flax blossom also is in season, called korari, and, when mixed with fern root, also makes a species of confectionary; the natives also commence on the young potatoes and turnips, and make taro ovens of the mamakou (pith of the mamaku tree fern), and of a species of the ti, the stem of which is the eatable part and is called koari; it is very sweet and pleasant to the taste.” He enjoyed the juice of tutu, poisonous if you don’t know how to handle it, but the Māori had found out that it was the seeds that were toxic. It was not all good news, and Brunner complained that “this month also the sandflies are most numerous, driving the natives to all sorts of expedients to get rid of them…”
And so, having reached Paringa, Brunner began the long trip home and it would be half way through June before he got back to Rotoiti, on the way suffering the stroke that I wrote about earlier. Food continued to be a serious problem from time to time, which drove Kehu to extremes to ensure that they did not starve. Brunner had great difficulty getting him away from places where they might find nourishing foods. On one day, they had 21 wekas, two paradise ducks, one grey duck, two dabchicks, two sparrow hawks, and three eels, prompting Brunner to write: “What we are to with all these I do not know; eating them while sweet is impossible…” And he remarked that “…there is some difference between the stock of provisions we now have, and my dietary in the month of May last year” – when they had been struggling with near starvation in the beech forests of the mid-Buller River valley. I’ve not otherwise read of humans eating dabchicks or sparrow hawks, and you have to wonder what meat was on the former, or how they caught them. At one stage, Brunner had four kakapo and these were a common food of some early explorers. But, presumably on the basis of their earlier experience, Brunner found that, even if they had “loads under which they could scarcely stagger”, nothing would induce Kehu “to pass a weka, or remain at the fire if there was the chance of an eel in the river”.

On one morning, as they were packing, Brunner counted 54 eels of average weight 3lb, “making a heavy load for us to carry”. Even then, they had only advanced about four miles when Kehu “…found a good eel station and nothing could induce him to pass it…” The party slowly made their way up the Grey River, initially having the luxury of using canoes to progress, and they eventually found their way to Rotoiti, Brunner, and back to Nelson, civilisation, reliable supplies of food, and shelter from inclement weather and, one may surmise, his first hot bath in 18 months.

However you view it, this was epic exploration, and leading to recognition by the Royal Geographical Society in Britain. But Brunner’s ultimate purpose in making this trip was to discover good farm land and the fruits were rather minimal, though he did later become involved with the establishment of towns at Westport and Greymouth. A friendship with Kehu seems to have persisted through the rest of Brunner’s life, as the New Zealand Dictionary of Biography tells us that Kehu was “chief mourner” at Brunner’s funeral at Nelson Cathedral.
This section is something of a pot pourrée, but gives a glimpse into the breadth of topics that Bob mulled over, and some of the values that were important to him. It includes essays that provide insights into Bob’s upbringing and the importance of family and fishing in the Taupo area (The Year of the Frog; Memories of an antediluvian Tongariro fisherman; Taupo’s rips of the 50s live on, How much is a river worth?).

Bob also goes far back in time to look at the impact of the massive Taupo eruption of 186 AD when over 100 cubic kilometres of material was ejected from the main vent, with the ensuing huge impact on the surrounding area and rivers throughout Hawke’s Bay.

In essays on the demise of the Selwyn River and its legendary brown trout fishery, and changes to the Tongariro River resulting from the Tongariro Power Scheme of the 1970’s, Bob ruminates over the value we place on rivers and the inevitable trade-offs associated with economic developments. His answer to the question he poses on the worth of a river: “It depends on what sort of world you want to live in”. Bob comes down heavily on the side of the intrinsic values of wild places and healthy outdoor pursuits.

His essay on the formation of a new lake in the Young Valley, Wanaka catchment, provides a backdrop for a wider discussion on landslide-formed lakes, and their colonisation by plants and fish. “Fish, pain, and civilisation” seems an unlikely combination of topics but in this essay, Bob explores the purpose of pain and concludes with comments on the need for respect and humane treatment of ourselves, others and the environment.

Finally there are three essays that deal with the interactions of native and introduced species, a contentious topic but one that Bob had researched extensively. His overall conclusion is that there are many instances where trout especially have had negative impacts on native fish in New Zealand (and in other Southern Hemisphere countries), but that their introduction has also had many positive benefits and provided recreation for many, including himself. However, he makes a strong plea for further research on the impacts of exotic species so that future management can be based on science rather than anecdotal evidence and intuition.
4.1 The Year of the Frog

_Fish and Game_ 19, 2007

R M McDowall, author of _New Zealand Freshwater Fishes_ as well as more than 200 published scientific papers, is now working with the National Institute of Water & Atmospheric Research (NIWA) in Christchurch. Here, he shares a favourite childhood angling adventure that had some curious twists and helped lead to his lifelong interest in fish biology and behaviour.

As far as I know, there has never been a year like it. A year when frogs made up the bulk of the food of big rainbows and brown trout lurking and feeding around the mouth of the Waimarino Stream where it flows into Lake Taupo's southeast shores in Stump Bay. One of the most fascinating things about summer angling in the lake, as well as a source of frustration at times, is the fact that one never knows where the fishing is going to be good. At least that was my experience as a lad, spending summer holidays around the lake in the 1950s and 1960s.

We would arrive for several weeks camping amongst the blackberry and gorse along the lakeshore, hoping for a spell of good fishing, but would never know where the fruitful fishing was going to be found. Usually, we spent the first few days scouting around, exploring known haunts, quizzing the local shopkeepers and watching for places where there was more than the usual amount of angler activity. In the summer of 1957 – seems half a lifetime ago, and I suppose it is - we heard a whisper that there was exceptional fishing at the mouth of the Waimarino. It was a rather unknown fishing spot then, as there was no road down the left bank to the mouth as there is now. Not many people were known to fish there. The lake had been very full for several months, and the area of swamp between the main road and the lake shore in Stump Bay was very wet, almost spilling across the road.

To get to the river mouth, a 20-minute trudge was required, down a wet, muddy track along the north side of the river from the small parking area which still exists near the main road bridge. It was a tiring and awkward walk. In many places, there was slushy mud and water up to your knees and numerous tree roots and fern bases to stumble over during the walk back out in the dark through thick blackberry and manuka scrub.

But it was worth it, although the toll on anglers and fishing gear was heavy. During that three-week summer of fishing we lost the middle section of one rod and broke the middle section of another. The only way to get out was to dismantle rods to avoid getting them entangled in the bush. It was such a muddy trip that once lost, a rod section was hard to find the following morning.

The first evening we arrived down at the mouth unprepared, just as the sun was setting and the mosquitoes were emerging for a night's feeding on unsuspecting anglers. The full swamps were an ideal breeding ground.

Being unfamiliar with the area, we took a while to get our bearings and fish effectively, but we soon learned. There wasn't much room and the area would accommodate only a dozen anglers, and the word soon got out. The high lake had flooded back into the mouth and lower reaches of the stream and as a result there was a long, quite deep pool at the mouth – unlike the usual shallow reach pushing across the lake shore sands.

The pool at the mouth was enclosed in willows and manuka, grading out into a small sandy beach on the right bank, gave a chance to wade out a little, and provided some room for backcasting.

Our first evening, arriving late and unprepared, we were too late to find good fishing spots. We did poorly. Giving up at 9.30pm, we began to work our way back along the track and encountered an angler fishing alone, well back from the mouth, at a deep pool where a derelict boat had been moored. The boat was half full of the biggest brown trout I had ever seen – seven or eight of them up to 6kg, taken quietly from the same deep pool, and quite an incentive to return.

We soon learned that the fish were taking on a Green Orbit, a fly we had never used, but which is essentially a bright green-dyed Dorothy. It was fished well out, initially with a swift retrieve on the
surface to create a bow wave - that was long before specialist floating and sinking lines. We used silk lines. Then the fly was retrieved very slowly and as deep as the pool permitted. The theory, and actuality, was that the fish were feeding on frogs, hence the surface retrieve. Breeding by frogs in the swamps had been just as successful as mosquito breeding.

When driving down the main road on a warm, moist evening, large numbers of the tiny, newly-developed frogs about as big as a 50 cent coin would jump across the pavement. Obviously, the trout had found that they were in the swamps and in the evenings moved into the mouth of the Waimarino to gorge.

Brown trout are well-known for their picky feeding habits. Most brown trout anglers will be able to tell stories of their frustration at casting over an obviously busy, feeding brown that will take absolutely no notice of one fly after another carefully cast over it. Paradoxically, browns are also known for consuming a wide variety of aquatic animals, as well as terrestrial animals that find their way onto the surface of the water. Among the latter, cicadas, wetas, mice and ducklings find their way into the mouths of big browns. There even is record of a tui being taken.

In the summer of ‘57, it was frogs that attracted the browns, as well as rainbows at the Waimarino Stream mouth. My angling records show that we took 64 trout there in about three weeks over 13 nights – 12 of them browns, the rest rainbows. The fish didn’t always come in, so sometimes we had a good bag and at other times caught few. Hooking the browns was a special skill as they took softly, nothing more than the most gentle suck. And if you missed the suck, you missed the fish. Early on, we missed plenty. There was nothing distinctive about the rainbows, just the usual assortment of fish up to 2.5kg, and as variable in condition as rainbows at Taupo river mouths in the summer were in those days of very high Taupo fish populations.

Some were good, some bad, and most rather ordinary. It was not many years later that a no-bag limit was introduced in Taupo waters as attempts were made to reduce fish populations and encourage better growth and conditions – a far cry from today with a three fish bag limit.

However, the browns were a different story. They were big fish, the largest we took a little less than 5kg and most more than 3kg. In the dark, it isn’t easy to tell what has been hooked. A large brown often plays like a poorly-conditioned rainbow jack - rather dogged and unspectacular. However, the difference became obvious as fish were landed. As was usual around Taupo, we carried no landing nets and the fish were gently beached and then flicked up onto the sand with the toe, except it really was not a matter of a flick with 5kg browns. It took a determined sweep of a wadered foot.

Some evenings we took several of these big browns. My records show that for the night of January 15, three of us took 10 fish, including four browns weighing 2.8kg, 3.3kg, 3.5kg and 4.2kg. The following night, when I paid for it by breaking the mid-section of my Hardy “Crown Houghton”, our bag of 12 included two browns of 3kg and 3.6kg. I imagine these fish resembled those a few knowledgeable and specialist anglers now catch in the lower Tongariro. The distinctive thing about the Waimarino, apart from the fact I have never known this sort of fishing to occur there again, was that many of the fish we took had been feeding on small frogs, frogs which were a product of the prolonged high lake levels, and just like the frogs we encountered on the main road on damp evenings.

During my formative years as a lad, which preceded and probably stimulated a career working on New Zealand’s freshwater fishes, I had a habit of carefully examining and documenting the food eaten by the trout we took. I suppose this was not because I wanted to know how better to catch the fish, but rather from a fascination that has never left me about the patterns of nature, predator and prey, ecology and behaviour, and so on. The 64 trout we took from the Waimarino that summer contained 207 frogs, and this was a minimum as by the time the fish were cleaned some of the frogs were well-digested and it was often hard to be sure just how many there had been. It might have been expected that the big browns were the chief frog predators, but this was not so. The 12 browns contained 35 frogs, or nearly three per fish. Thus the 52 rainbows contained 172 frogs, or 3.3 per fish. So there was not much difference between trout species. One of the browns, a healthy 3.5kg, contained 12 frogs, but two
smaller rainbows of only 1.6kg and 1.7kg each contained no fewer than 15 frogs. Another rainbow of 1 kg had taken 14 frogs. It is probably no surprise that these two evenings when we had the best fishing were also when the fish had been feeding most eagerly on frogs - 22 fish and 119 frogs, or approaching 5.5 per fish.

What does this tell us about trout feeding? Obviously, that trout will eat frogs if they are available, though this seems seldom recorded in either the popular or scientific literature on trout diets. I know of nowhere with a comparable account of trout consuming frogs so consistently and in such large numbers. It really only shows how adaptable both browns and rainbows are when it comes to obtaining food. They are predators which will feed on whatever is available and nutritious at the time and place, including frogs.
A year ago this month two floods raged through the Tongariro River within a week, the second most experts considered was the biggest since 1958. It has changed the river. R M McDowall, who extensively fished the Tongariro pre and post 1958 flood, revisits the old days and makes some observations on what to expect after the 1998 flood damage.

Floods like the one that hit the Tongariro river last year are the sorts of happenings that "reset history" – they become historical events around which yarns are told and against which contemporary events are measured. The 1998 flood, however, was only the second major flood that affected this river in living memory. There was another in 1958. I don't know which was the larger, and it really doesn't matter. What is almost certain is that the 1958 flood had much more immediate impact on the river after a very long period of stability, by comparison with the 1998 flood. Hickling described some aspects of that flood from the perspective of one who lived in the river's banks at the time in his book Freshwater Admiral, that was published in just the year following. But I imagine that there are few people who can still remember the river prior to that flood.

In my mind's eye, I can still see the first rainbow trout I hooked in the Tongariro. I think it was in 1953 and I would have been 13 years old (begins to sound a bit like a television advertisement for Werthers Original sweets!). As a family, we had recently started a lifelong habit of camping on the shores of Lake Taupo, then among the blackberry and gorse that used to cover much of Mission Point. That area had long been used by campers, mostly from around Wanganui and Palmerston North, and each family had an accustomed place to camp. In those days, there was no formal control over camping around the lake, but at Mission Point, an elderly, gentle Māori lived in a hut among the pine and gum trees near the mouth of the Waitetoko Stream and he kept a careful, friendly eye on what was happening. He knew us all, and where we camped, and we seldom feared that “our” spot would be taken by some newcomer: old Tauri Paul made sure of that.

We were just learning to fish, and as we became familiar with the geography of the area, we gradually explored the various parts of the lake and its inflowing tributaries, mainly around the southern and eastern shores, but by no means only those. We got to know the Tauranga-Taupo and Waimarino well, visited Waitahanui often, and found the pleasures of fishing the rips of the Kuratau and Omori. But the Tongariro was a bit more forbidding and something of a mystery.

In mid-January 1953, after packing up for what was then a long, dusty, winding drive home to Palmerston North across the rough, still gravelled Desert Road , my father suggested we look in at the Tongariro for an hour on our way home, just to see what it was like, and we did. We found our way to The Hut Pool, a little downstream of what was then a very embryonic Turangi township. As a rather slight lad, I found The Hut Pool difficult to fish because it was so big, and the wading tough. It was then a huge, long reach of water pulsing through a narrow rapid at The Stones, and gradually spreading and becoming shallower as it partly spilled left into The Boat, and then pushed on to drop away a bit to the right from The Nursery at the bottom. The left bank was grassy with lupins, and had a drop of about a metre into the gravel beach, making access easy, but the right side was a deep channel, running along beneath manuka and kowhai trees – and that was where the fish lay.

Well, fishing out as far as my little Sealey Rainbow cane rod would throw a silk line, I hooked a fish, an old river jack rainbow, still mending from the previous winter's spawning, deep, and black, and crimson, as it jumped and splashed at the surface, before the tension went out of my line and it was gone. That was enough. The Tongariro had captured our attention, as it was to eventually capture our affection.

We fished that pool in the winter in the following years, and came to know it well, and love it. Before the Ministry of Works rebuilt the old one-way wooden bridge across the river at the main road, there used to be a little triangle of land on the upstream side of the true right bank - an apparent no-man's land which just grew blackberry and manuka. No one seemed to own it, and no one seemed to use it, except us. My
parents, younger brother and I had regular dates with the Tongariro River when we camped there for a week or so each May, during the school holidays, as well as at other times. And we would walk the river in the crisp early winter sunshine fishing the middle pools of what was then a difficult and majestic river (before hydro development, flow diversion and control, and all the other things that have been imposed upon it). We would be up at dawn, often having to crack the ice off the top of the milk bottle, have a quick breakfast, and try to be on the river as the sun hit it.

The Hut Pool was a consistent favourite, especially in the early morning. In those days there would be a bit of fishing pressure from time to time, but mostly it was a pretty relaxed affair, and often you’d have a pool to yourself, or with two or three congenial companions. There was no need to be there before dawn to get access to fishing - there was plenty of room for everyone. We all fished, and my mother became well known around the river, both as one of the few women who then fished it, and also as a cunning and successful angler. She could not cope with the weight and depth of the flows down much of The Hut Pool, and so would often fish The Stones. This was a reach of water at the head of The Hut Pool, which had to be fished from the right bank, whereas the bigger water of The Hut Pool was fished from the left. It was narrow and deep at the top (like any pool), making for an easy cast across the river - not unlike the top of The Major Jones today, though somewhat wider. And as you worked your way downstream it became both wider and deeper (again like any pool!), and in the heart of the pool it was a long cast across to the manuka-clad right bank. This tempted anglers to wade out as far as possible, and only the big men could cover the whole pool. Wading well out was hazardous, as there were big boulders here and there, and these had to be circumnavigated with considerable watchfulness if the swift flows were not to knock you over, pick you up and carry you off. So, you’d edge downriver foot by foot, feeling for the big 'ghoulies', and circumnavigate them with real care.

Well downstream a torrential rapid swept away to the left into The Boat, which was a short, rushing pool that took about a third of the river’s water. It occasionally held fish, and sometimes we would be tempted to move down there - usually only when nothing was doing in the main pool. To get to The Boat you had to cross the head of that branch in the lower Hut Pool and then work down to fish it from the right bank. It was difficult wading, and I can still sense the terror of being washed off balance, and going down to wrap my sodden arms around a large boulder while I repositioned my feet (and my dignity), and slowly edged my way back to the bank, fortunately still with my rod clutched in my hand - though I don't know what instinct made me hold on to it. The Boat didn't seem to hold fish much.

The bottom of The Hut Pool was known as The Nursery, and here there was a wide expanse of gently flowing water which eventually split into several small channels. It was a metre or two deep and was my favourite part of the pool. In those days, before there were sinking lines, it was really difficult to get your line down around the bottom. This was then a general problem never experienced by those who haven’t fished with silk lines - and for those who haven’t, there is still no line that handles as beautifully as a silk one, but they didn’t sink well and did rot, eventually, no matter how much you cared for them. Getting your line down was a learned skill. I have vivid memories of memories in The Major Jones pool in the early years of our familiarity with the river. I was fishing slowly down from the head, and all old chap was sitting, enjoying the sun and the birds and the river, on a seat among the kowhai trees on the left bank. I cast across, let a little line run, waited for a moment or two, and then begin to retrieve, and the old fellow yelled: “Leave it to sink!” So, I left it for what I thought was a sensible time and start to retrieve again. And he bellowed: “No, leave it to sink!” I thought I had, but he knew better, and he was right - a good lesson for a youngster beginning to discover the ways of the river.

Well, in the water around The Nursery, at the bottom of The Hut Pool, several things happened. The water was a bit shallower, and it was also a little less swift, making it easier to get a fly near the bottom, In addition, big boulders scattered around provided resting spots for trout moving up stream through the river. I had some of my best success sweeping the tail of the pool, at The Nursery.

And I found the same in The Major Jones, where sweeping the lower pool around or just up stream of the wire could be very productive. Of course, that area of The Major Jones has changed drastically, too,
since “development”. Today, it is possible to wade down the pool and cross onto The Island with relative impunity (or it was until the 1998 flood—I’ve not been back since), whereas prior to hydro development and flow control the river was bigger and you wouldn’t dare try to do that!

There was never really another pool in the Tongariro like The Hut Pool, if you were big enough to wade it and could cast far enough to reach the far bank, and there still isn’t a pool to match it as far as I know—a huge, swirling mass of deep green water, rolling along beneath the bush-clad right bank—and I have vivid and rich memories of early mornings, with the sun getting up turning the green water into gold for a few minutes, mist lifting off the surface, peppered by midges and Mayflies emerging, fantails flitting after the flies, tuis busy in the trees and once, even, a blue duck paddling shyly around the shallow margins. We tried all the pools and enjoyed many of them, but inevitably seemed to be drawn back to The Hut Pool. It was almost always where we started on a fishing trip as if, having renewed our acquaintance with that wonderful piece of water, having “paid our respects”, we were then at liberty to explore more widely without having betrayed a friend. And, of course, sometimes this great pool let us down, and we had to search elsewhere for our fish.

Often it was cold in the early mornings of May, and by nine or ten o’clock we would be ready for a more substantial breakfast, and would return to our camp. Sun on the tents in our little camping spot would have warmed everything up and we would relax for an hour or so before spending the middle of the day exploring lesser known pools and corners and getting to know the river better. My most lasting and enriching memory of my parents is them standing together on the banks of the lower Major Jones, wader and parka clad with rods in their hands, watching me as I threw the sort of line that only a big Hardy Wye would throw, and with the relaxed, slow-actioned ease that only these wonderful rods would throw it, right across the pool, to let it sweep my fly amongst the boulders. The trout fishing, and the river became a rich part of our family lives. When he was younger, my father vowed that he’d never take up fishing, as it would take over his life. Well, he did take up fishing, it did take over his life, and he submitted to that takeover knowingly, easily, happily, and with no regrets. He was still catching fish from the Tongariro in his mid-70s, and until a month or two before he died. The size and weight of the river drove my mother in her older years to the more gentle and friendly Tauranga-Taupo, where she was still catching fish in her 80s, so frail of limb that she could no longer scramble down the river banks to land her fish, and had to depend on others nearby to do so for her (and they did it with generosity, good humour, and admiration for an old lady).

We caught a lot of fish out of The Hut Pool, as well as elsewhere, and sometimes even in a good fresh it would yield fish. I recall standing there watching the brownish water streaming past in a modest flood—water nearly to the top of the grassy bank, wondering what to do. We thought we might as well fish as we had nothing else to do. And there were rainbows there if you had the nous to go after them, tucked behind grassy clumps or boulders that had not long before been exposed on the river bank. I’d landed a couple of fish when a car drove down the track and a fellow got out. “Getting fish even in this dirty water!”, he said, unbelieving. And I replied: “Yes, and there’s another one a few yards further downstream”, because I’d seen it broach the surface near the bank, probably after moving up stream into the heart of the pool from The Boat just a few moments before. And as he stood and watched, I cast and caught it! He shook his head in disbelief and drove away.

The big flood of 1958 wrecked all that. Some pools, like The Major Jones, survived, largely unscathed. But The Hut Pool disappeared completely, and never again has there been anything comparable. We were lucky to have had the experience. According to Hickling in Freshwater Admiral, since the flood: “Below the highway bridge The Swirl and Hut pools are a series of shallows and runnels.” Bain and Greig, in their small book on the river, remark only that the area within which The Hut Pool lay was “completely devastated in the 1958 flood”, and listed The Hut Pool and The Nursery as among those destroyed. And in Tony Jensen’s account of the Tongariro, we can read: “No area suffered more ... The river here was devastated and be came unrecognisable”. The Hut Pool had been consigned to history, living only in the memories of those who knew it and enjoyed it. Jensen writes, with feeling that I share from personal experience: “To the hardy and perennial fisherman, the loss of The Hut Pool, in particular, was a tragedy.
A mighty pool, generous in its bounty, had gone forever”. That’s so true. Following the flood in 1958, the pool became a broad, shallow, rather uninteresting and characterless sweep of water with few redeeming features, and the pool of old was gone. I’m told that after the 1998 flood, the river in that area is now even worse.

Partly as a result of the 1958 flood, and partly I suspect because the prescribed minimum flow in the river is very often the maximum flow for long periods, I don’t think the Tongariro has ever been quite the same. This is not just nostalgia, though I would confess to a hankering to renew the experiences we had with the big, bold river it once was. But in addition to the loss of the majestic and challenging Hut Pool, there have been other changes. I have a hunch that the river doesn’t hold the fish like it used to. The pools are not as big, and have become shallower. Perhaps flow regulation means that the same power that the river once had to carve out the pools is no longer operating. The impression I get is that though there may be just as many (or nearly as many) fish running up river to spawn during the late autumn and winter, they don’t hang around in the river as much as they used to. Maybe, on its day, when the fish are really running, there are just as many fish there and the fishing is just as memorable. But maybe, too, the runs are briefer, and over sooner. If you are there on the right day it’s superb, but if you’re a day or two late or early, then the fishing is harder than it used to be.

Following the 1998 flood, of course, the river still has to restructure itself, and it will be a year or two before the pools settle down and become familiar to anglers. It’s a great time for those who are more mobile and adventurous, who can explore the new pools and find the new lies - and they may do well. For those who want to return to familiar places and catch fish from traditional lies, it will be much harder. The flood will certainly sort out the observant and careful anglers from the rest. Whether anything comparable to The Old Hut Pool will ever redevelop, only time will reveal, but I am not getting my hopes up.
4.3 Whatever happened to the Selwyn?

_Fish and Game_ 26, 1999

The Selwyn River, named after New Zealand's first Anglican Bishop, George Augustus Selwyn, was once described as the best brown trout fishery in the world. Today, it “is just a faint shadow of its former glory” having experienced a “monumental decline” in spawning runs. The Selwyn may still hold some fish, but the fishery hangs rather delicately in the balance. Bob McDowall tells this remarkable story of deterioration.

The Selwyn River flows into the western margins of Lake Ellesmere - a large, brackish coastal lake a few kilometres south of Christchurch city that is separated from the sea only by a narrow coastal bar. The bar is breached artificially, at times, to allow the level of the lake to drop, and thus to prevent the excessive flooding of farmland around the western margins of the lake, but for much of the time the lake is closed to the sea by accumulation of gravels at its outlet.

Perhaps it is fitting, too, that the Selwyn River that bears the Bishop's name became a renowned brown trout fishery, a fish species that epitomises English angling culture. And what a fishery it once was. The river still attracts a lot of interest from North Canterbury anglers, especially a few with the particular, special knowledge and commitment to successfully exploit its productivity. I well recall going down to the lower Selwyn, trout fishing, one evening not long after I moved to Christchurch from the North Island in the late 1970s. I knew nothing about it, but, after an unsuccessful evening fishing there, when packing up to go home about 11 pm, I was a little humiliated to find that the “real” anglers were just arriving. They knew that to catch the wily browns that populate the lower river and its outlet into the lake, you need to be there in the small hours of the morning.

A former colleague was involved in a car smash on his way home from an “evening” fishing the Selwyn - at three o'clock in the morning! Though I was well used to night fishing around the Taupo rips, we stopped fishing there at 11 pm, ostensibly because the regulations required this but, quite frankly, we had usually had enough by that time. Late night fishing at the lower Selwyn River is thus “another” sort of night fishing. There is a story of a rather officious honorary ranger of the North Canterbury Acclimatisation Society who hid in the bushes well into the night - just to catch and book an angler who could not wait till midnight for the opening of the season and who was charged in court, as a consequence, for starting to fish in the lower Selwyn at five minutes to midnight (if I recall correctly, a sensible magistrate threw the case out as utter pettiness, and so he should have, in my view).

So, these are the sorts of exploits that characterise the modern Selwyn brown trout fishery, and the sorts of things that anglers and rangers will get up to. There are two groups of “huts” at the lower Selwyn, largely owned and used by Selwyn anglers and Ellesmere game shooters, which are a testament to the popularity of this area (“huts” at the mouths of Canterbury rivers are the local equivalent of North Island “baches” and Otago “cribs”). In a good season, anglers can get trout of large size and in superb condition from the lower river as it enters the lake, and from the lower pools of the river itself. Some anglers use techniques that the purists might scorn, such as live baiting with bullies that abound in the lake - so, as is becoming increasingly obvious, the skilled and successful Selwyn angler is an individualist of an idiosyncratic sort.

All of this comment about the Selwyn River, its modern trout fishery, and its importance to North Canterbury anglers, accepted, it is only a shadow of what it once was. It is unlikely that Bishop Selwyn had any knowledge of this fishery as, by the time he left New Zealand to return to Great Britain, brown trout were newly arrived here and only just beginning to be released into our rivers. Just when brown trout were first liberated into the Selwyn is uncertain. There were trout in the Avon River in Christchurch city by the late 1860s, and it seems very likely that the Selwyn River was not far behind. There are certain records of browns liberated into the river by 1871, but I somehow doubt that they were the first. In the very early days of brown trout acclimatisation, well-settled farmers of the district obtained brown trout fry or ova to release in “their” rivers near their properties, and it seems almost inevitable that the Selwyn
River was the beneficiary of such releases from very early times. Whatever the origins of the first releases, they were certainly not the last! In R.C. Lamb's history of the North Canterbury Acclimatisation Society there is a list of liberations into the Selwyn in 1872, 1874, 1876 (twice), 1877 (twice), 1878 (twice) and 1879, and Lamb reports that the river had soon begun to provide "good sport" - one day in December 1882 W.S. Cooke reportedly caught 10 fish, totalling around 220kg. But he was outdone by a Mr McPherson who took 52 fish over an evening and morning, and these were up to 2.3kg. And there were fish from the Selwyn on display in hotels around the area, soon afterwards, up to 11 kg and 90cm. Brown trout weighing 4-5kg were described as common. Not a bad beginning, for sure.

The early North Canterbury Acclimatisation Society was nothing if it was not an active and solicitous manager of its trout fisheries. Originally, it reared trout for release at its hatchery in Hagley Park, in central Christchurch. However, the bounty that was available in the Selwyn River was quickly noticed, and the Society could not resist exploiting it. They soon began to harvest this stock, in earnest, for release elsewhere, including for sale to other acclimatisation societies (who says that our brown trout stocks have never been commercialised?). Thousands of fish were transferred out of the Selwyn for release into the Avon River, in Christchurch, beginning in 1902 when 220,000 ova were taken, and in addition 15,000 yearlings were taken out of the river for release in the Avon. Another 200,000 ova came out in 1908, though 2000 yearlings were returned. The society had for several decades been maintaining a brood stock at its hatchery as its primary source of ova, but they reduced the number of brood fish being kept in 1909, as they recognised that "any quantity" of fish was available from the Selwyn. However, as if just a little uncertain of this "any quantity", or perhaps not believing that nature could nurture the ova and young trout as well as they could in their hatchery, the Society hedged its bets and returned 12,000 fry and 1500 yearlings to the Selwyn. The same rather schizophrenic behaviour was repeated in 1911 - again according to the Society's annual report, "any quantity" was available from the Selwyn, but they remained a little uncertain and returned 20,000 fry and 2000 yearlings (this rather reminds me of a story told of my older brother who, aged about seven, wandered around our house claiming with bravado, in the company of his younger siblings, that Father Christmas "doesn't exist" - but when my parents were locking the house before going to bed on Christmas eve they found a note pinned to the front door which said in that brother's childlike writing "the McDowall's live here" - he too was hedging his bets, having one each way!). And so it continued.

In 1918, the Society took 1.5 million ova from the Selwyn, of which they sold 1 million - so it became not only a source of ova, but also of cash. But the following year, the Society's annual report expressed concern about the "disappearing fish" in the Selwyn. It instituted moves to stop the "wormers", to curb "poaching", and to halt "inbreeding" (whatever that was), but they still removed 1.4 million ova. The 1920 figures were: 1.1 million ova taken and 70,000 fry returned. For 1921: 1.3 million ova taken and 175,000 fry returned; 1922: 1.7 million taken and 245,000 fry returned. And for 1923: 1.4 million ova taken and 170,000 returned. Things rather fell apart in 1924, however, as having presold 600,000 ova, the society could only manage a harvest of 860,000 ova. Undeterred, they were back in full swing in 1925, when the figures were 1.3 million ova harvested and 170,000 fry returned. Trouble returned in 1926 when floods disrupted the ova collection. They only managed to extract 240,000 ova and had to buy 1 million from Southland, of which 275,000 were returned to the Selwyn. The tally for 1927 was 1.3 million taken and 355,000 returned. The fishery was apparently still thriving, despite the occasional hiccups, as the society's 1927 annual report wrote of bags of seven to 10 fish being common, with some bags of 12-15 fish; four anglers each took over 200 fish for the season. Bags of 12 trout were described as "common" in 1928 with fish up to 8kg. The society took 1.7 million ova in 1929, of which they sold 1.4 million and returned none to the Selwyn, rising to 4.3 million in 1934, with 340,000 fry returned to the river.

Clearly, there was a rapid resurgence in the society's confidence in the Selwyn fishery, as in 1932 they boldly proclaimed that bags of 50 fish "were the rule rather than exceptional", with fish ranging from 25kg. The society extolled the little river's virtues in 1937, pontificating that "For many years the lower Selwyn has borne the reputation of being the best three miles of brown trout fishing in the Dominion, or probably the world, taking into consideration the numbers taken from the lower water each season
and their large average size. This confidence seems to have rather evaporated just as rapidly because by the very next year they were expressing concerns about numbers “falling off” and in 1938 the society placed a limit of ova take of 1 million, with attempts to derive additional ova from other waters. However, this apparently proved too much hard work, and the following year (1939) they were back into the Selwyn and took 1.4 million ova!

The river, and its associated lake had clearly developed a widely known reputation, and anglers came from wide and far, local, national, and international, to sample the sport that the fishery provided. Anglers were fishing to catch trout for sale - two fishermen boasted of having taken half a ton of brown trout from the Selwyn for sale, and that for three to four months had made a living doing so. Then, in 1916, Minister of Internal Affairs, George Russell, publicised plans for commercial harvest of fish from Lake Ellesmere, with a proposed smokehouse, and marketing of trout on the nearby Christchurch market. Predictably, the society raised a storm of protest that included enough threats and bluster to persuade the Minister to quickly change his mind. No doubt, catching trout for sale continued, nevertheless.

It is really fascinating to ponder what the society thought it was doing during these years, and what sort of natural trout production they considered the Selwyn River was capable of. The society seems to have had little or no idea what the river’s fishery was like either numerically or in terms of its ability to produce ova or fish. The problem was that they really had little or no comprehension of how big the Selwyn/Ellesmere trout population was, and therefore had no logical basis for managing the fishery or determining how many ova could safely be extracted. The 1939 society report states that they counted nearly 19,000 adult trout in the spawning run in July alone (or production of around 14 million ova), and of course the spawning run extended from April to September. Another census in 1941 counted over 12,000 fish in the 1940 run and, bearing in mind that “very large numbers” had preceded the installation of the trap and that many spawners got past without detection during a flood, they estimated that the spawning run exceeded 37,000 fish with a total ova capacity estimated at 50 million ova. To cap it all off, a census of the run in 1949 gave an estimate exceeding 65,000 spawners and the number of ova available was just incredible - probably over 90 million ova! This rather puts the ova take during the previous 40 years, which on the face of it looks very substantial indeed (up to several million ova a year), in a rather different perspective. It also makes the numbers of fry that the society returned to the river, as some sort of payback or substitute for those taken, look both totally pathetic and equally unnecessary. It is doubtful that they were doing anything more than allaying their own pangs of conscience at the way they had treated the fishery in this little river.

The North Canterbury Acclimatisation Society long ago gave up these massive hatchery releases. Doing so was driven partly by the work of Derisely Hobbs (a local Canterbury man and originally one of the North Canterbury Society’s councillors), which showed that, in general, the numbers of trout being released into New Zealand rivers by the acclimatisation societies were totally insignificant compared with the numbers being produced naturally by the river’s own trout populations. The decision to abandon hatchery production was probably also driven partly by the costs incurred in catching the spawners, incubating the ova, and rearing and releasing the progeny. In addition to these questions, the numbers of fish in the Selwyn River were declining drastically. The society reinstated the trapping programme in the 1980s to reassess the status of the fishery, and the number of spawners had dropped to only around 500 fish! This figure is only 0.8% of the peak 1949 run.

One might seriously ask what on earth has happened to cause such a monumental decline? It seems that there is no simple explanation. Suggested causes include:

- the North Canterbury Acclimatisation Society’s prolonged and massive egg take from the river’s spawning run
- poaching of trout from the lake
- netting of trout from Lake Ellesmere by gill netters fishing for mullet and flounders
- abstraction of water from the Selwyn for irrigation by the catchment’s farmers
• decline in the quality of the water in Lake Ellesmere
• the effects of the Waihine Storm in 1967, which destroyed weed beds in the lake, and the consequential effect on the lake's food chain that supported the trout population.

Some of these postulated causes can be discounted quite simply. Fairly obviously, judging by the numbers of fish taken during the spawning censuses of the late 1930s and early 1940s, the egg take was both small relative to the actual ova numbers available naturally in the river, and they stopped too long ago to have significant present impact. The same is true of poaching, and probably true of gill netting in the lake. Abstraction of water has been blamed for resulting in long stretches of the river drying up during the summer and autumn. However, there are reports that this dates back into at least the first decade of this century - when the society’s annual reports state, for instance, that “large portions of the Selwyn have been dry owing to the drought”. However, there can be little doubt that the length of the Selwyn River channel that is dry for long periods today is greater than formerly. And it is also possible that the dewatered reaches are now so extensive, and that dewatering lasts for so long during the year, that access to the best spawning grounds may be prevented.

Scientists of the former Freshwater Fisheries Centre (FFC) of the Ministry of Agriculture and Fisheries, in Christchurch, viewed this decline in the Ellesmere/Selwyn trout fishery with both interest and concern. Gordon Glova of the FFC, and staff at the Centre’s Glenariffe Salmon Research Station in the upper Rakaia River, instigated a research programme in cooperation with the North Canterbury Acclimatisation Society. One hypothesis that could be tested experimentally without huge expense was that the fishery was declining because of recruitment failure – that in spite of the millions and millions of ova that the fishery had produced in the early years of this century, there were now not enough being produced to sustain the fishery as it once was. Brown trout fingerlings were reared at Glenariffe, and these tagged with coded wire tags, their adipose fins clipped to indicate that they had been tagged, and the fish released into the lower Selwyn. Anglers catching trout in subsequent years were asked to return any fish with their adipose fins removed to the FFC for removal of the tag and determination of release date and size.

The results from this experiment were rather disappointing. The experiment was curtailed by lack of funding before enough information could be gathered to draw any really useful conclusions, particularly as regards management of the fishery through augmentation of releases. One thing became clear – not many tagged fish were reported as having been caught, but those tagged fish that were caught had grown very well and when caught were in excellent condition – such as the four year old brown trout taken from the lake in November 1995, which was 3.2kg and just 548mm. This, at least, shows that Lake Ellesmere was in the early 1990s capable of producing good growth and well-conditioned trout, and thus that it was unlikely that the decline in the Selwyn River fishery was due to poor growing conditions in the lake. The limited research documents show that recruitment failure is the cause of the decline, but this remained a very open question.

Although it is only a few years since this research was undertaken, changes to the lake continue to make themselves felt. In the last year or two, commercial flounder fishermen working in the lake have had a very lean time. Prospects have at times been good for years ahead, as the fishermen have observed good recruitment of juvenile flounders into the lake from the sea. But these juveniles have not grown and survived, and have not moved through into the cohorts of fish available for the fishermen to exploit. The few flounders taken have tended to be very skinny and have had empty guts. Locals have observed that the huge swarms of midges that customarily occur round the lake shores on still summer evenings have almost disappeared. So the productivity of the lake seems to be in further decline. This may be due to eutrophication of the water from nutrient-enriched runoff from the surrounding farmland, and nearby settlements discharging their sewage into streams that drain into the lake. These effects may have been exacerbated by recent very warm summers, as well as drought conditions that have reduced inflows into the lake. All this is anecdotal and requires scientific verification. In the meantime, the Selwyn River trout fishery, once described as one of the finest brown trout fisheries in the world, has become just a faint shadow of its former glory. There is still a fishery there, and brown trout are pursued
in the lower river by a group of diehards who relish fishing a bully or a wet fly into the early hours of Canterbury mornings. The fishery’s state hangs rather delicately in the balance. Its future relies very heavily on the condition of the lake, and efforts to reduce the amount of effluent reaching it need to be increased.

The Waitangi Tribunal recommended that the bed of Lake Ellesmere should be returned to Māori ownership and control. For Māori, who call it Te Waihora, the lake has a profoundly important history as a source of food, particularly eels - Ngai Tahu call it “Te Kete Ika o Rakaihautu”, or the food basket of Rakaihautu. Ngai Tahu leader Rakiihia Tau has articulated his wishes for the lake’s future as being to see “Waihora retained as a sustainable mahinga kai, that is a sustainable fishery supporting the associated resources for this generation and beyond”. Tau has admitted that: “Although sounding simple, this task would tax both the energies of Ngai Tahu, and technical and scientific persons working in the area of hydrology and habitat restoration”. With such goals pre-eminent among Māori for the future of the lake as a traditional source of food, the future of the trout fishery can only also look up – Ngai Tahu goals for the lake are not inconsistent with the needs for an improved trout fishery. However, it will take more than moves to improve the lake’s water quality to allow the trout fishery to recover. A whole complex of interacting forces needs attention, including:

- careful management of the lake’s entire catchment
- reduction in irrigation abstraction from the Selwyn
- restoration of flows in the river to allow access of adult fish to the spawning grounds
- maintenance of flows to allow the eggs to develop and the young fish to return to the lake
- and probably other changes to the way the watershed and its fisheries resources are managed.

Clearly, the best has already been. The future does not look bright, and maintenance of a trout fishery in the Selwyn River and Lake Ellesmere will depend heavily on the resolve of the Ngai Tahu owners, local authorities, and the North Canterbury Fish & Game Council, the lake’s fisheries managers. I suspect that the Bishop would not be happy about the way “his” fishery has deteriorated.
4.4 We know so darn little

*Fish and Game* 27, 1999

Foremost expert Bob McDowall revisits the delicate issue of native fish and trout interactions and concludes that anecdotal evidence is not enough. We really don’t know definitively everything that goes on between species in the community ecology of our streams. It is, says McDowall, “high time some explicit research was undertaken that begins to explore the mechanisms that govern the interactions of native and introduced fisheries”.

Two recent articles in *Fish & Game New Zealand* have now explored the question of native fish and trout interactions. Ben Wilson (*Fish & Game New Zealand Issue 8*) reviewed earlier literature on the topic and gave the subject a Fish & Game Council perspective. Billy Hamilton and Henrik Moller (*Fish & Game New Zealand Issue 25*) had another look, and discovered that “brown trout” have been one of the most “successful introduced species in the world”. They went “offshore” for evidence because “Research on trout impacts in New Zealand is incomplete”, and they found there, what we already knew very well in New Zealand, that where trout have been introduced, there often seems to have been a decline in native fishes – that what Māori had reported in lakes in the Rotorua-Taupo area in the late 1800s and early 1900s (decline of kōaro, or lake whitebait populations that were important to them as food), was being mirrored in lakes such as Titicaca in Peru.

They canvassed the Australian literature where they claimed to have found novel information on the impacts of trout on Australian galaxiids. However, Australian knowledge and data are actually no different from our own - largely anecdotal, and they know rather less about their native fishes than we do, especially about their galaxiids which tend to occur where trout do well and are therefore the species most likely to suffer harmful impacts. What they report seems to me, little more than the “overseas expert syndrome”. The Australians are struggling as much as we are to understand the ecology of the interactions of trout and native fish.

I first got interested in the question of the impacts of exotic fishes in the mid 1960s, stimulated by several things. First, there was a proposal abroad that largemouth bass should be introduced to New Zealand as an additional game fish for warm northern waters where trout did not thrive. A senior government fisheries scientist, who happened to be my boss at the time, was supporting the proposal, and it was close to getting government approval. After having a close look at the issue, and discussing the question with North American colleagues, it quickly became obvious to me that:

• though the largemouth bass is a fine sporting fish, it is a fish predator, and to thrive and provide quality angling it needs a fish forage species as prey
• there were no suitable prey species in New Zealand – experiments with rainbow trout, which are rather less piscivorous species than bass, showed serious decline of native biota in the sorts of lakes where bass were proposed for release
• thus either largemouth bass would be a failure or we would need to follow up bass introductions (with all the risks they posed to our native fish fauna), with introduction of a prey species for bass to feed on, thus creating an additional risk to the native fauna
• the individual who was proposing bass releases had earlier written: “Little evidence has been adduced as to the actual extent of the threat and one cannot avoid the feeling that sentiment has played an undue part in the formation of some of the opinions expressed”, and from that I concluded that he really had little knowledge of the native fish fauna and had even less concern about it.

The trouble was that hitherto no one had really cared enough to even look, apart from pioneering amateur freshwater fish biologist Gerald Stokell. So, rather with my “head in my hands” as a junior fisheries scientist on the New Zealand scene, I set to exploring the whole issue of the impacts of introduced trout and the likely impacts of largemouth bass on the native fauna, and produced a literature analysis which has formed the basis for ongoing discussion over the past 30 years. The problem with this sort of exercise was that there were no hard data. Everything was anecdotal, or a little
better, circumstantial. It is not often that the implications of doing things like introducing new species were evaluated before they were done in the late 1800s, which of course explains why we have deer and rabbits and possums and mustelids and so many other exotic species here. With regard to the introduced fish question, the sorts of anecdotes that could be found made for disturbing reading for anyone with an interest in the native species.

Especially clear was the fact that, prior to colonisation, Māori used to depend very heavily on kōaro *Galaxias brevipinnis* (whitebait) population in the lakes of the central North Island for food, but that by the late 1800s or early 1900s there were not enough kōaro left for them to exploit in traditional manner, but there were heaps of trout there – Zane Grey’s “Anglers’ Eldorado” was to be found in rivers like the Tongariro. Moreover, by this time the trout populations of these lakes, formerly thriving and abundant with fish of huge size, were in serious decline. It was known that the trout preyed on the galaxiids, and it was realised that the trout were apparently eating themselves out of house and home. Māori pleaded for a cessation of trout releases to protect their interest in kōaro as a food source, but their pleas were unheard or, if heard, they were ignored. The conclusion that trout predation caused the kōaro decline seemed obvious then, and still seems obvious to me, but it was, and still is, based on circumstantial evidence. The fact that trout condition recovered when another more robust forage species, the common smelt, *Retropinna retropinna*, was introduced, perhaps confirms that it was food shortage that caused the trout populations to decline.

Much later, experimental introductions of rainbow trout into a Northland lake in the 1960s were followed by decline to near extirpation of dune lakes galaxias, *Galaxias gracilis*. Again although the conclusion that trout had caused the decline seemed obvious the case remains anecdotal. The evidence was always circumstantial. And so it continued for many years. Those of us working on native fish increasingly began to “feel” that there was a negative association between trout and native fish, and again came to the obvious conclusion. But then things became a bit more confused when some research on native fish suggested that native fish may also have a harmful impact on native fish, and there is an interesting conundrum for you. NIWA biologist David Rowe thoughtfully concluded that the introduction of smelt into trout lakes may have had the effect of depressing populations of kōaro in the lakes. Someone had released smelt into Lake Rotopounamu, near Tokaanu, and Rowe found that before long the kōaro population was gone. So, he concluded that it was likely that smelt in Lake Taupo were having an effect on kōaro additional to the apparently already significant impacts of trout. And then some analysis that Richard Allibone (now another NIWA biologist but then at Otago University), and I did, suggested that the establishment of a prolific lake population of kōaro when Lake Mahinerangi was formed on the Waipori River, in Otago, may have resulted in a severe decline in the populations of other galaxiids in the tributaries of the newly formed lake – dusky galaxias, *G. pullus* and Eldon’s galaxias, *G. eldoni*, seemed sparse or absent where kōaro were present. Thus there seemed to be developing a hierarchy, with smelt harmful to kōaro, and kōaro harmful to dusky and Eldon’s galaxias. And brown and rainbow trout are apparently harmful to galaxiids, too, whether kōaro, dusky or Eldon’s. The one bright spot on the horizon seems to have been that smelt can handle trout predation – if the continuing abundance of smelt in Lake Taupo and the known role of smelt in trout diet are any indication. But, as people keep saying, all the evidence has been anecdotal or, at best, circumstantial, which is not much better.

Something of a change took place with the establishment of the Taieri River Long Term Research project by Colin Townsend, based at the University of Otago. Colin and his associates began some very detailed exploration of the fish fauna of the Taieri River and found a largely complementary distribution of galaxiids and brown trout. In 198 sites sampled, about equal numbers had either no fish or only trout or only galaxiids, and just 9 sites had both fish species; and, as Hamilton and Moller relate in their article, Townsend and Crowl found that the galaxiid populations in the Taieri were typically above falls which exclude trout from waters further upstream. The few instances where the two species were present together seemed to be unstable, shallow, shingly streams where perhaps trout don’t do quite so well and galaxiids perhaps do a little better, enabling coexistence. The evidence was no longer anecdotal,
but clearly numerical. There, we saw clear evidence of an explicitly negative association between galaxiids and trout. What people had been saying for some time was elegantly demonstrated from a thorough survey. But although the evidence from the Taieri was no longer anecdotal it was still largely circumstantial – it essentially showed that where trout occurred there were no galaxiids – or – you could argue that where galaxiids occurred there were no trout.

The problem remains, that we still don’t know why trout and native fish seem to have mutually exclusive distributions, and until we do we are no position to take informed remedial action. It is said that trout eat galaxiids, and so they do. But to move from that fact to the conclusion that trout predation causes the decline in native fishes has its risks (even if fairly clear in lakes like Taupo). Other things could be going on. There could be competition for space between galaxiids and trout in streams – both can be drift feeders that would want to occupy the best sites in streams for drift feeding. Or prey consumption by trout may be causing such decline in food organisms that the galaxiids are starving – certainly John Hayes’ work on trout energetics suggests that trout must be eating a very substantial proportion of the benthic insect production. And the famed Horokiwi Stream trout study of the late 1930s suggested that the trout may actually eat more food than is available, prompting the use of “Allen’s paradox” to refer to what is something of an enigma amongst salmonid ecologists. So food competition may be important. Or habitat quality changes may be implicated as a part or total explanation.

I can take you to places where we caught large numbers of galaxiids in the 1960s, but where they can’t be found now. How do we explain that? Is it due to the continued, on-going effects of the trout that were always there? Or to the spread of trout into those areas since the 1960s? Or has there been environmental deterioration relating to land use, farming, forestry, rabbit plagues, or what ever? Who knows? The problem is that even though, at least for the Taieri, there are now explicit data that show a negative association between trout and galaxiids, we really don’t actually know why. We may know that trout eat small galaxiids, but cannot presently determine whether predation is basically cropping a surplus of juveniles that won’t survive, anyway, or is so intense that the entire population is being eaten. We really don’t know what is going on in the community ecology of these streams and what the causal factors are.

In earlier decades, it was common for ecologists to talk of interspecific competition when two species were both using the same resource – until it was realised that unless the availability of that resource was less than the demand for it, competition could not be invoked. That is, a correlative relationship (association) does not necessarily mean a functional relationship (cause and effect). It’s a bit like the relationship between smoking and lung cancer. Data show that people who smoke get lung cancer more often than people who don’t smoke. That does not prove that smoking causes lung cancer, although nowadays, there are so many studies that demonstrate this association that we are pretty much convinced that there is a causal relationship. Anecdotal observations gather more power in proportion to the volume of data on which they are based. The problem with the native fish issue is that there are not those huge volumes of data – just snippets here and snippets there, that are rather suggestive and which combine to cause more serious concern.

When I began canvassing this issue over 30 years ago, these snippets were even more sparse. And you could criticise me for making so much of so little. But in those days very little indeed was known about native fish and there were few who cared about them. Furthermore, when you are dealing with the survival of species there is no scope for error – extinction lasts for a long time! There is a need to apply what the Department of Conservation rather smugly calls the “precautionary principle”, which really means to take extra care not to cause damage by doing something until we know what its effects may be. So, I make no apology for hyping up the issue to achieve what seemed to me to be a critical endpoint. And I claim some success in doing so. My analysis of the potential impacts of largemouth bass was completed somewhat after the senior fisheries scientist (my former boss) promoting the introduction left New Zealand for overseas, and so I was no longer in such peril from criticising my superiors. Moreover, the analysis was published, in 1968, and I continue to have considerable pleasure in reading a footnote to that paper that, quite unknown to me, was inserted just before the paper was
published, which said: “Since this paper went to press the government has declined to authorise the introduction of largemouth bass into the coastal dune lakes of North Auckland (Cabinet decision of 6 May 1968).” This of course is another instance of correlation – two things happen together but you can’t be sure that one caused the other, though I have a hunch that I know there was some cause and effect and I take some pleasure in it. We don’t have largemouth bass in New Zealand, and I am forever grateful for that decision.

So, where does all this leave us? We ought long ago to have got well past depending on anecdotal evidence. Moreover, in a way, the fact that the more recent circumstantial evidence is of better quality than the old anecdotal evidence is in danger of obscuring the fact that we have yet to demonstrate cause and effect and are in a poor position to provide a remedial or mitigative response. For myself, I continue to be concerned about both the message that the anecdotal evidence is giving, and about the need for better information. It is high time some explicit research was undertaken that begins to explore the mechanisms that govern the interactions of native and introduced fishes. Only then can we make informed judgements about what management and conservation actions are needed to really ensure the survival of our priceless heritage of native fishes, while at the same time (hopefully) keeping the magnificent introduced trout fisheries that are so highly valued by so many, both in New Zealand and internationally. The situation could be quite serious. There are all too few waters left where there are not brown or rainbow trout. Trout are still being liberated into some pristine waters – such as Lake Orbell in Fiordland National Park in recent decades, ideas of putting rainbow trout in Lake Macrae in the Marlborough high country, proposals for quinnat salmon in Boulder Lake in northwest Nelson, and the recent appearance of brown trout in Lake Christabel at the head of the Grey River in Westland. Mosquito fish were introduced near the former Wildlife Service’s trap at Lake Tarawera, ostensibly to control the mosquito nuisance there, and there has been much discussion of their liberation in many other localities by people ill-equipped to make rational decisions. And we are all well aware of the spread of catfish, rudd and other exotics. It is never too soon to get to grips with the ecology of these introduced species and to examine their impacts on native fishes. But it can certainly be too late for the native species.
4.5 Taupo’s rips of the ‘50s live on

Fish and Game 50, 2000

The more things change, the more they stay the same. This is certainly true of fishing Lake Taupo’s many river mouths. Bob McDowall reminisces.

Arguably the most famous trout fishing spot around Taupo, if not around the country, is the mouth of the Waitahanui River, about 10km southeast of Taupo town. Known (legendary) as the “picket fence” (for that’s what the anglers look like, from a distance), it is a place were ordinary travellers often stop and wonder what on earth a group of mature men are doing, standing hour after hour up to their waists in water, fine weather or foul, in the hope of catching a trout. To the casual observer, they so seldom seem to. The fame of the picket fence has several sources. Mostly, I suppose, is its accessibility to those of the general public who know nothing about trout fishing. This peculiar ritual known as trout fishing seems to them all mystery, or total nonsense. But in addition it is handy to Taupo and was probably the first of the river mouths around Taupo that was consistently fished just because of that proximity in the days of poor roads, or none at all. It was made famous as a somewhat elitist place to fish by Budge Hintz’s book Trout at Taupo. And, of course, it is a place where good bags of trout can be caught, sometimes, in spite of the fact that the ordinary traveller does not see this happen very much.

But the Waitahanui River mouth is only one of many places around the lake where anglers gather to fish – places often known to the anglers as “rips”. And my Concise Oxford Dictionary writes of a rip as a “stretch of broken water”, which is what you see at a river mouth as the current of the river’s flow hits the “wall” of stationary water in the lake. Especially at night and early in the morning, you can find groups of anglers, either wading or in anchored boats, fishing the rips. And no matter how small a stream is, you’ll find anglers there from time to time. Even the diminutive Waitetoko Stream, near Mission Point, will attract anglers if it is heading straight out into the lake. If undisturbed, there will almost always be a fish or two sitting just beyond the accumulation of soft sand that develops out in the lake a few metres, and if you arrive there at such a time you can easily catch a fish with your slippers on – but usually only one. I remember arriving at Mission Point (my parents had one of the caravans permanently parked there) late in the evening after the drive from Wellington and as my wife prepared for bed I said: “I’ll just go and see if there is a fish at the creek.” It was one of those still, cold, star-lit, autumn evenings, and as I expected, the stream was flowing straight out with no wind to blow it along the lake shore. I cast, caught a fish, and was back at the caravan before my wife had finished her cup of tea.

This sort of thing can happen everywhere round the lake. Clearly the fish are accumulating at the river mouths. Catches vary seasonally, but I am unaware that there is much pattern except that numbers increase during the late autumn and winter as the fish begin to run upstream to spawn. But there is far more to it than that, as there are often fish there over the spring and summer, too. I think that several things are happening. The river water is typically colder than the lake water and this cold water may attract the fish, especially when the lake is warm.

The river water may also have more oxygen than the lake water. Huge shoals of smelt accumulate around the river mouths and no doubt the trout know this and assemble there to feed on the smelt. Possibly also, some food organisms are carried down into the lake by the streams which attract the fish. Maybe, too, just the presence of some current is attractive. And, as already mentioned, at least in the autumn and winter, fish accumulate there as they begin to migrate to spawn.

Anglers have long known this and I have memories of large bags of fish from both The Delta (mouth of the Tongariro), and the Tauranga-Taupo. At one period during the 1950s, I think, there was no bag limit at all in Taupo. The lake was brimming with fish and as a result they were in poor condition. The aim was to try to cut down the stock of fish (it’s a different story today). And some huge bags were taken, including once when two anglers were fishing off the spit on the lakeward side of the Tauranga-Taupo mouth and had a heap of slabs half a metre high on the sand. Not any more and I am not sure whether to be pleased (fewer slabs) or disappointed (fewer fish).
Though almost any angler can catch fish at the rips, as is usual in all fishing, the 80:20 rule can apply – 80% of the fish taken by 20% of the anglers. I recall being moored at the Tauranga-Taupo one summer evening, my brother and I, and we were catching the odd fish. Right next to us were two men from the Tauranga-Taupo village – locals they were and they knew what they were about. They were catching fish after fish after fish and had to be doing something we were not. So we discussed it and then just sat and watched them for a while. Soon we were catching fish as often as they were and went home with 13 for the evening. They cast out a longish line and then let another 10-20 metres run with the current. Then they sat and had a smoke and a yarn for several minutes and then picked up their rods, started to retrieve. “Bang!” they had a fish on. We followed suit (except that we didn’t bother with the smoke). Thus there are clearly local skills and experience involved. Picking the current is one key factor. I mentioned before that the little Waitetoko has to be flowing straight out into the lake and this is probably important because it helps the fish to locate the stream water entering the lake. If it isn’t running straight out it can be dug out with a shovel in a few minutes and anglers often do. With a little time, the fish will move inshore. The Tauranga-Taupo fishes best if there is a northerly wind. This seems to cause a wind-driven current to flow southwards along the shores of the lake to the north of the river mouth and towards it, and that wind-driven current pushes the river flows out into the lake. If there is a westerly, the opposite happens. The river flow is forced inshore along the lake margins and the fishing is not so good.

With the Tongariro, it is more complex as the river is big enough to counter lake currents and it is a matter of messing around across the rip for a while until you find where the river current is flowing and anchoring in a place that allows you to exploit that to best effect. Get in the right place and on the right day the fishing can be exhilarating. My mother took one trout there when her line was dangling over the back of the boat while she had a cup of tea and I imagine that is not a unique experience. Often the place to fish is signified by the location of boats already there. But if you arrive and it’s empty you have to find it for yourself. I heard recently of a fellow who arrived to find The Delta empty of boats and spent the mandatory 10-15 minutes locating the current and, after anchoring several times, eventually found the spot, or at least thought that he had. A few minutes later a guide came along with a client and parked his boat not far away. The incumbent quietly said to the newcomer: “If you fish there the current will swing your line around under my line and hook it up.” But the guide, of course, knew better, cast out, and handed the rod to his client who began to retrieve it into the bottom of the boat. A few moments later, the incumbent felt a pull, struck, and found that, yes (surprise!), the guide’s line had hooked his. So he retrieved his line, unhooked the guide’s fly, dropped it back into the lake, and cast out again – and the guide followed suit. Soon, the incumbent had another pull, and had been hooked by the guide’s fly yet again. So the process was repeated, except that this time the guide’s fly was dropped back into the lake a little more ostentatiously, as if to make the point. He cast again, and the same thing happened – almost. This time, the incumbent retrieved his line (and the guide’s of course), hooked the guide’s fly over the gunwale of his boat, and went back to his fishing, while the guide and his client sat and watched.

There wasn’t much else they could do, was there? After about a quarter of an hour, the incumbent quietly unhooked the guide’s fly and let it slide into the lake, without ever stopping fishing.

Eventually, the guide found that his line was now free, so he retrieved it, upped-anchor, and took his client somewhere else. Understanding the flow patterns at places like The Delta is the key to both successful fishing and good angler relationships.

During the 1950s, most of the fishing at rivers like the Tauranga-Taupo was done wading from the shore. The river used to run northwards along the lake shore and the actual rip was well north of the present site. I recall thinking lights from the school were a nuisance at night. I think it was a combination of the huge 1957 flood and some river control works undertaken by the local authority that caused the mouth to retreat to the south. And it has stayed there. The same is true of the Waitahanui and in those days there was room for several dozen fishermen at both rips.
Wading the rips can be a dangerous business. The river is continuously sweeping sand downstream and out into the lake and this sand is dropped when the flow of water is retarded by the stationary lake water. Gradually, as the sand continuously sinks, a tongue of sand builds out into the lake, and the further it goes the deeper the lake, and so the sharper the drop-off at the point at which the sand is deposited. Towards the tip of this tongue the sand can be extremely soft and unstable and a wader can easily lose his footing and be washed out into the lake. In John Sierpinski’s little book, Taupo Fishing Guide (published in 1969), such an event is related. My parents, who fished around the southeastern shores of the lake a great deal from the 1950s through 1970s, knew Sierpinski well. He was an emigrant from Europe, a tall, slim, angular man with a strong foreign accent, who, in his older years, had discovered and had grown to love the angling around the lake and was an avid and successful fisherman. My parents used to refer to him affectionately as “Da vish isn’t dere”. Sierpinski knew when the fishing was good and when it wasn’t he didn’t bother – the fish weren’t there. His book emphasised the dangers of the Tauranga-Taupo River mouth and related how “a local angler, a Māori, expertly cast out his line and then, without breaking it, brought [a] helpless angler to a safe footing.” That helpless angler was my father and, as Sierpinski tells, he bought his rescuer a Hardy Wye in gratitude for saving his life. As Sierpinski said: “The water shelves deeply and requires the greatest caution.”

Undoubtedly, the best rip fishing is at night because that is when the fish will move out of the depths of the lake to the shore. Darkness is a kind of “cover” for fish. It was at night that we had our first experience of lure fishing around the lake in the early 1950s. As lads, my brother and I fished there in the summer in bare feet and shorts and obtained a very quick lesson in casting as any sloppiness led quickly to a tangle and a tangle doesn’t become obvious to the novice caster until it is a quite serious “bird’s nest”. Moreover, sorting out a major tangle by torch light at night is no one’s version of fun. In the beginning, our mother would come with us and patiently help us deal with the tangles, but soon, perhaps in self defence, took up fishing herself and matched us men both in skill and productivity.

We were always looking for ways to increase our success. Old George Flight, who then owned the garage at Tauranga-Taupo used to make a little extra money selling flies that he made. Among these was a gargantuan Craig’s Nightime – a Pukeko fly that he tied onto the largest hook I ever fished with. They looked impossible, gross really, and were hard to cast as they ended up shooting past your ear if you were not careful. But they really worked if fished very slowly across the bottom at the Tauranga-Taupo mouth – probably acting as an imitation for a small crayfish which once (but perhaps no longer, and that’s another story) abounded on the lake bed. It occurred to my brother, that a “little light on the scene” might attract trout. So he bought some phosphorescent paint from a jeweller – what they used to make the numbers on a clock luminous at night – and painted a dab of this on the nose of a Hairy Dog. You had to fire them up by shining a torch on them for a few seconds and they’d stay “fired” for several casts. You can buy flies like this today, but in the 1950s no one had ever heard of them and we kept it pretty quiet – weren’t even sure it was legal. I recall using one among a group of anglers at a river mouth one evening. Having just fired it up, I began to cast and the angler next to me said: “What was that?” My fly was obvious, hurtling back and forth in the darkness. We didn’t call them “fire-flies” for nothing. I just pleaded ignorance and went on with my fishing. We certainly thought they worked, though I have no objective information that we caught any more than with an “unadorned” Hairy Dog. Much of fishing success relates to confidence in the gear you are using. I still have one of these “fire-flies”, now about 40 years old, and still “firing” with the right treatment.

Over the years we fished most of the accessible rips, from Waitahanui in the northeast, south around the lake shore including Hatepe, Waipahi, Waitetoko, Tauranga-Taupo, Waimarino, Waioataka, Tongaririo, Omori, Pukawa and Kurutau. Not having a fast boat, the rivers of the Western Bay were beyond us. All of them produced fish at times; all of them let us down at others. Sierpinski’s little book is long out of print and probably forgotten (or never heard of by most of today’s anglers other than those who are book collectors). But it will tell you about all of the Taupo rips. In addition, at least for me, it still recreates something of the feelings and atmosphere of fishing there. Find it and enjoy it. I was there.
4.6 How much is a river worth?

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Bob McDowall writes of the love his family shared for fishing, and specifically for the Tongariro River, and asks New Zealanders – politicians, accountants, economists, investors and engineers among them – to thoughtfully consider the significance to our national well-being that accrues from having beautiful places and healthy activities such as fishing that keep people refreshed and productive in their ‘other lives’.

One of the richest memories of my parents is of them standing on the grassy banks of the main highway side of the Major Jones Pool, and then watching me work my way down the pool, casting a big line across, and allowing it to run around in the current of the boulder-strewn reach of the river just above the ‘wire’. I caught a lot of fish there over the years – ‘sweeping the tail’, as I used to call it.

Of course, the Tongariro was a much bigger river in those days, before construction of the Tongariro Power Development Scheme meant that it had a ‘minimum flow’ – I guess, in practice, ‘minimum’ really means ‘actual’ most of the time. Thinking about it raises for me the deeply fundamental question: How much is a river worth? I suppose, as another naturalist once wrote: “It depends on what sort of world you want to live in.”

In the days of which I write, you couldn’t rather idly wander, fishing your way down the Major Jones, then head out into the middle of the river, and keep on going down and down, and then emerge onto the Island Pool itself, as I’ve watched anglers do with apparent ease in more recent times. I recall fishing there with a friend, a novice fisherman, and he almost got caught by moving too far down and too far out, seduced by the lower reaches of the pool. With more and more of the water running behind him into the Island Pool, he very nearly got to the position where he had too much water behind him, as well as too much water in front of him – a sort of no-man’s land where there were few options. I had to rush down and warn him and he just managed to edge his way back across the flow that was heading into the Island Pool onto the banks of the Major Jones, and he got a nasty fright doing so. It seems that it is no longer like that, since flows were controlled for the Tongariro Power Scheme. So, when I talk about the Tongariro of the 1950s, I’m talking about a distinctly different river from the one we see today, even given the February 2004 major flood.

There is an old notebook in which my dad kept notes about fish and fishing and included there was his record of a comment I made to him about the Major Jones: “R. likes to be down towards the wire as the sun hits the water.” Makes me quite nostalgic, in a way, as I never get to fish the Major Jones anymore and my dad died 30 years ago. So those few scrawled lines in a notebook that was his, holds all sorts of memories for me that I treasure and are unrepeatable.

I knew the Major Jones Pool well and caught a lot of fish there. The river below the kowhai trees along the bank would turn a shade of greenish gold, small flies would be busy across the surface of the water in the light mist, and fantails would be hawking them in the early morning sun. Once, I even saw a rare blue duck paddling around the pool – obviously had come too far downstream. As the sun began to hit the water, my experience was that you could often winkle a fish or three from the boulder-strewn run at the bottom of the pool and I loved fishing there. As my parents watched, I would have been casting with a big Hardy Wye, its relaxed and powerful action being an interesting contrast with the shorter, lighter, and rather frenetic action of modern carbon fibre rods. Two or three lazy, but power-filled swings, my line would shoot, and my fly would drop just below the far bank, and would begin to swing across and down the river’s flow. There my parents were, black profiles, wader and parka-clad, rods in hand, on their way over to fish the Island Pool and they had stopped to watch. They had given me the rod and no doubt were absorbing the pleasure of seeing it in action. In fact, they’d have taken pleasure in the pleasure I took from using it, and having them watching me do so. Good feelings all round!

So many things are different now. Both my parents are long gone. The river is nowhere near the challenge it once was. Carbon fibre has replaced cane. And though I am 40 years on in life, the richness
of that memory carries with it all sorts of fragrances that relate to the many hours we spent on the river as a family, my parents, my brother and me.

Before the new road bridge was constructed (seems a bit odd to call it new, as it must have been constructed in the 1960s and that’s half a life time ago), there was a little triangle of land, just upstream of the bridge on the south bank. It grew nothing much more than a few broom bushes, some manuka and willows, and a few pine trees that gave us shelter from occasional southerlies. But the trees being to the south meant that our little camp would bask in the sun, as we often returned for a mid-day nap, before heading out to fish in the late afternoon. The bit of land was probably river reserve, though we never enquired – once had a chat about it to the fellow who ran the garage opposite and he said he saw no reason to prevent us camping there (It would be a different story today, I suspect). Often in the May school holidays, or on a long weekend, we would head up to Turangi, from Palmerston North, pitch our old-fashioned ‘green-top’ tents among the bushes, and fish the river. Sometimes the nights were so cold that it was a question of going to bed with virtually all of our clothes on, and cracking the ice out of the milk bottles for breakfast. But if that was the case, we knew that we had a lovely crisp, clear late autumn/winter day on the river ahead of us. We would fish around the river as we fancied. Often in those days we could have pools to ourselves for a while, with no need to get there at dawn to be first through. I recall, though, once being frustrated at a couple of anglers anchored in the top of a pool and, after watching them for a while and seeing that they were not moving, I sneaked past them and waded in further down than they could see round the river’s bend – a bit naughty, I suppose, but I preferred the lower reaches anyway. Eventually they started moving and caught up with me in the lower pool and, as I pulled one fish out after another, I can remember a frustrated “not another one” echoing down the river.

As a family, we fished widely around the Tongariro, upstream to the Red Hut and beyond, occasionally as far as the Blue, and downstream to the majestic and incomparable Hutt Pool, the Nursery, and the Boat, of which no remnant remains since the 1958 flood carried it all away.

But I get ahead of myself. My father used to say he would never take up fishing, because he was scared that it would take up all his time. He knew himself well, but in the end he did (take up fishing) and it did (take up lots of his time). He was a quite highly strung and intense man of towering intellect, spending his working career as an organic chemist at the Dairy Research Institute in Palmerston North, where he and his colleagues provided the research backing that established the dairy industry as one of our country’s most important export earners. Despite his intellect, he was able to interact easily and usefully with the managers and staff of the (then) many dairy factories around the country and I recall hitchhiking home from university one holiday and being picked up by a man just near Longburn. As would always happen, we got talking and eventually I found that he was the manager of the Longburn Dairy Factory, so I cheerily said: “You might know my old man!” “Who is he?” he asked. And I replied: “Fred McDowall.” And he turned on me with a ferocity that I can still feel, telling me in no uncertain terms not to refer to my father in such a derogatory way. “Show a bit of respect!” was the message communicated. Why, you might wonder. Well, I suppose in those rather old-fashioned days, this fellow expected me to show more respect for a man who was so widely known and respected in the dairy industry for nearly four decades.

My mother, aware of the stresses my dad was under, and also conscious that there was probably no way she could persuade him to take up fishing, arranged for a much-loved uncle to teach me trout fishing. And over some months he and I would head out to the Manawatu River to fish for the brown trout that abounded there. About that time, when I would have been about 12 years old, an industry colleague of my father’s invited us to camp with him on a Māori property on the Kaituna River, a few kilometres downstream from the Okere Falls at Lake Rotoiti, and it was there that both my dad and I caught our first trout and (hoping this is not too much of a pun) we were hooked ourselves. Mine was caught on a rod of yew wood with a greenheart tip, using a wooden Nottingham reel, a silk line, with cuttyhunk backing, which will give you some idea how long ago that was. With a “bit of help from his friends”, my mother’s ruse had worked and my dad was a devoted angler for the rest of his life. He just loved being out on the lake, or exploring the rivers. They never had a lot of money, but I recall him saying: “If there is something
I want for fishing, I'm going to have it!" And though never extravagant, he did spend money on rods and reels and other accoutrements of trout fishing.

Heading home that January, after that happy holiday at Rotoiti, we stopped for the night and camped among the willows and poplars in Mission Bay (you're not allowed to do that now) and were hugely attracted to the big, limpid lake. And it was not long before my dad had discovered that there was a camping area at Mission Point where a number of friends and colleagues from Palmerston North were already regularly camping in the summer. We went there the following year and my parents never afterwards went anywhere else for their summer holidays, various members of our family often with them, though one by one each of us slowly drifted off into careers, lives, and families of our own. The caravan that they eventually bought and sited at Mission Point is still there, used by members of our family.

A year or two later, and when it was time to go home after a summer holiday at the lake, we packed early with the intention of spending an hour fishing in the Tongariro and I can still see in my mind's eye, a big strong, red-sided rainbow broaching in the old Hutt Pool – the first of many that I hooked there. Fishing around the lake became a much loved recreation for some of us and, especially for my father, it became a rich catharsis for the stresses of his work. And then after retirement, filled with the delights of sharing his later years around the lake and its rivers, with my mother. And I know that my mother saw with huge and warm pleasure, the benefits and enjoyment the two of them had over many years. Dad caught his last fish, aged nearly 75, in the Bridge Pool in October or November 1974, and died just a few weeks later. My mother, who became a really skilled angler (she trained as a zoologist, and that's quite something for education of women in the 1930s) and one of very few women anglers around the rivers in our early days there, was still fishing the Tauranga-Taupo when well into her 80s. She was so frail that she could not clamber the couple of metres down the gravel banks of the old Crescent Pool. But she loved being out on the rivers, could still cast a line, and depended on others fishing nearby to beach her fish and pass them up the bank. You can imagine that they did this with generous pleasure. My parents, though mostly enjoying a 'low profile', became quite widely known around the rivers. If there was any form of heaven on earth, I think they found it, together, on the Tongariro and Tauranga-Taupo rivers, and getting immense pleasure from each other's company. I have no doubt that my dad, especially, had as much pleasure seeing my mother catch a fish as he did in catching one himself and there were often times when she caught more than he did.

Thus is the immeasurable importance of places and of nature in our daily lives. We are at a time in New Zealand history when the pressure on water resources is immense – water to generate electricity, water to irrigate ever increasing acres of dairy farms, vineyards, orchards, and then, of course, the need to generate electricity to pump the water for irrigation (could be some kind of an interesting feedback loop there – which will we run out of first: water for electricity, or water for irrigation, or can we have as much of both as we like?). I've mentioned above the reduced flows in the Tongariro. There's been substantial debate about the Wanganui. We all followed the Waitaki debate. For a time, a decade or so ago, it was the Rakaia (then the bumper stickers said Save the Rakaia). There are probably thoughts of damming the Rangitata, though a recent National Conservation Order may help deal with that (and, anyway, the Rangitata has long sustained abstraction of 28 cubic metres a second to irrigate the Canterbury Plains). There are some people anxious about the Hurunui and others about the Kakanui. There are debates about increasing generating output from the Arnold River near Greymouth. Contact Energy has recently renewed its resource consents on the Clutha, though additional dams there must be on some power utility's agenda. Similar consents have recently been renewed also on the Waiau and we should perhaps take some heart from the fact that there is now a significant (increased) minimum flow in that river. But how many other rivers are getting intense scrutiny by the politicians, engineers, and investors? And when the accountants and economists and the people in Treasury measure the worth of lakes and rivers according to their assessments of the water they could pump out for irrigation, or how many megawatts of electricity could be generated, let them not forget the intangibles, and the
significance to national well-being that accrue from having beautiful places and healthy activities that keep people, like me and my mum and dad, refreshed and productive in their 'other lives'. Put a value on that if you can! But let’s not abdicate to the accountants and engineers. How much is a river worth, to you? That’s a question we fail to answer at our peril. And what sort of world do you want to live in?
4.7 Fish, pain, and civilisation

Fish and Game 46, 2004

I once had an elderly acquaintance, a noted lawyer who was a keen angler, and for some years on the Wellington Acclimatisation Society Council. A little pompous himself, he could not abide puffery, and when people at meetings carried on, mostly enjoying the sound of their own voice, he would murmur in a deep, resonant, grumbly voice: "Words, words, it's all just words." And reading the various articles on fish and pain, I'm inclined to agree with him. I think most of what has been written misses the point. But debate like this (or about shags!) is healthy, as it makes us think, broadening our perspective, at least for some of us.

The fundamental question is: what is pain and what is its purpose? Some might say it has no purpose, but I disagree. Several writers have mentioned "nociception" and, I suspect like most readers, I hadn't a clue what it meant so I turned to a dictionary - and it had to be a technical one. Nociception means, simply, the ability to feel pain, so knowing that really doesn't leave us any better off, does it, if we want to understand pain, in fishes or humans?

Well, the above aside, what is the purpose (if any) of pain? All animals can respond to external stimuli. Even the single-celled amoeba adjusts its direction of movement if it encounters an adverse stimulus. Some insectivorous plants move rapidly to capture insects as food. I strongly suspect that pain is nothing more than a highly developed response to allow us to avoid adverse stimuli - a highly evolved "encouragement" to react rapidly when something threatens our well-being, i.e. take our hand off a hot stove; notice a cut; realise that a muscle has been torn or a limb broken; have a cavity in a tooth. It is, in essence, a form of self-protection. If that is true, then presumably pain in humans is an advanced form of escape response to adverse stimuli found very widely across the natural world, regardless of the comparative structures of the brain in humans and other animals. And what is true in humans may well be true in some mammals – ever seen a dog limp when it has a thorn in its foot?

I would not be surprised if, as in humans, there is also a very wide existence of responses to stress and fear, mediated by the adrenal glands. John Hayes' studies on the catchability of native trout, and their rapid development of cryptic behaviour and fly-shyness after being caught and released, is a symptom of their response to at least stress or fear, and who knows, some form of pain.

But, in the final analysis, I return to my friend and: "Words, words, it's all just words" Why? Because I think we are missing the point. One correspondent to this magazine asked: "Does it really matter if a fish feels pain, or if instead it is a question of cruelty?" And he asserted that: "... man is a supreme hunter-gatherer who is born with the need to exploit that trait. He doesn't care if it is painful or harmful ... " Well, I think that is a Neanderthal attitude, and callous rubbish! One of the hallmarks of human society is something known as civilisation, and lots of the things that were once regarded as routine and acceptable are no longer acceptable in a civilised society. Cannibalism, racism, dog fights, cock fights, capital punishment (in most countries), child sweat-labour, castrating small boys so they could continue to sing soprano into adulthood. I could go on at length. The American Civil War was fought very substantially over the asserted rights of people in the South to have slaves and sometimes, it seems, to treat them in what now seems an inhumane way. Does our hunter-gatherer friend also assert his rights to some of these now long-proscribed human behaviours? None of these things (I hope) are now acceptable to anyone with any self-respect. And so (I would also hope) would mistreating other life forms. Is it okay for a small boy to get pleasure from pulling the wings off a butterfly, even if it doesn't feel pain? Most of us would (I hope yet again) regard that as sadistic. And so why should dealing with fish be any different? For me, it is a matter of what is commonly called self-respect, such that no 'self-respecting individual' would do these things anymore. For me, that includes mistreating trout.

Let me finish with a brief story. I was salmon fishing at the mouth of the Rakaia one morning and a fellow nearby hooked a fish. He began to play it with great care, excited at the prospect of landing one of the few salmon caught that morning. The fish put up a good scrap, but was eventually brought near
the river bank. It turned out to be a kahawai. At that point, this guy turned 180 degrees, put his rod over his shoulder, walked up the bank dragging the kicking fish behind him onto the gravel. When it was clear of the water, he turned round and kicked it until the hook came out, and then kicked it into the river. Says it all, doesn't it?
4.8 Return of the Big Bang

Fish and Game 58, 2007

Esteemed freshwater scientist Bob McDowall looks at the Lake Taupo ‘big bang’ of 186 AD, and the lake’s fish and fisheries today, and wonders if a volcanic event of such magnitude could, or will happen again. The news isn’t great.

I think I was about 10 years old when I first saw Lake Taupo. We scrambled up the old dirt-pumice road from Taihape in our lumbering pre-war Chevrolet, onto the Desert Road, past the central North Island volcanoes, and then trundled our way down again towards the lake.

I can remember the first view we had of the lake, as it appeared on the far horizon, and our father said: “There it is!” It was the first of many trips across the Central Plateau of the North Island to the lake, and in later years we children always competed to be the first to see it, sometimes perhaps more in our imagination than reality, until it became obvious to everyone in our family.

We were on our way to Lake Rotoiti, but spent a night camping among the poplars around Mission Bay, and we saw the lake from close at hand, still, and clear, and blue, and in my view the most delicious place to swim in the world. We would be back to camp at Taupo in the next summer, the first of many such holidays that were for me an introduction to trout fishing. For me, it was also the beginnings of my knowledge of the native freshwater fish fauna that became my life’s work, as we saw shoals of smelt and kōaro around the sandy shores of the lake, and watched bullies among the cobbles and boulders where there was a rocky shore. Occasionally, we would find large koura (or freshwater crayfish) cast ashore in a strong westerly blow – the sweetest of possible meat, though I would later discover that it was probably illegal for us to have them, even though they had been washed ashore naturally.

In later years, we would hire leaky, old, lumbering, clinker boats from George Flight at Tauranga-Taupo village – pick them up at the road bridge and row them down the river to Mission Point where we camped, and I can well remember the gentle, rhythmic rattle of the rowlocks as we rowed around the lake and learned the niceties of trolling. No lead or steel lines in those days, as fish could easily be caught in the upper levels in the deep, clear lake. I don’t know why that has changed. It could have been because the fish were much more abundant in the 1950s, as they were (for a time there was no bag limit, as the population threatened to outstrip its food supply, as it had in the early 1900s). Or it could have been that they were not being driven into deeper waters by the hundreds of boats that now power their way around the lake, churning up its surface waters. Maybe the lake is warmer in the summer then than it is now, when the fish seek cooler waters deeper in the lake. Who can know? There are probably lots of theories, none of which can be isolated as the ultimate cause.

As we drove across the Desert Road, our parents pointed out the sentinel mountains of the area and told us that these were periodically active volcanoes, and now and then we would see wisps of smoke rising from one or other of them. Very occasionally, there would be a minor eruption, making us wonder, sometimes with trepidation, how much more active the volcanoes were likely to become and what that might mean for the lake and people living around it. Mostly, the eruptions were a pretty tame affair. However, the breakout of the lahar on Ruapehu at Christmas 1953, which caused such tragic loss, was then but the most recent of others before it, mostly in prehistoric times. We had no idea of the violent history of Lake Taupo, or we would probably have been rather more apprehensive, and with good reason, as I would later discover. Though we had no idea of their implications, we saw the consequences of its past eruptions, such as the great beds of pumice sand on the lands around the lake, and the well-rounded lumps of pumice slopping to-and-fro along the lake shores, and took pieces home as pot-scourers, or to carve with our pocket knives. We didn’t know that Pihanga, a hill at the lake’s southern end, was also a volcanic cone, even if of rather lesser magnitude than its cousin Ngauruhoe, or that Tauhara at the northern end of the lake was another. We had some faint understanding that the areas of hot pools and the glop-glopping mud at Tokaanu were somehow related to the volcanism associated with the central North Island, and that the geothermally heated waters there, and at the Honeymoon
Pool near Wairakei, where we often swam in the cool evenings, were other manifestations of the area's continuing volcanic activity. We had heard that Mt Tarawera, near Rotorua, had erupted in a substantial way in the 1880s with substantial loss of life, and we probably also connected this in some simple and intangible way with the area's persisting geothermal activity, though the word geothermal would have meant little to us then.

What none of us, parents or children, had even an inkling, was the fact that the area was (is, actually), one of the most violent, recently volcanic areas in the world. Today, it is usually hard to believe that the beautifully clear waters of Lake Taupo were almost certainly once a seething mass of muddy toxic chemicals, in which no life could possibly have survived, and that for around 50,000 years it had been the centre of one major eruption after another, the largest being the Kawakawa event, around 22,000 years ago, when geologists estimate the ejection of at least 155 cubic kilometres of magma from the vicinity of Lake Taupo, just the largest of many such eruptions. In the most recent of these, geologists tell us, the lake was the site of what is probably the greatest volcanic eruption in human history, around 186 AD – events lasting perhaps several weeks that make the better known and more recent eruptions of Mounts Pompeii, Vesuvius, or Aetna in Europe, Pinatubo in the Philippines, Surtsey near Iceland, or Krakatoa in Indonesia, seem like trifling squibs. The evidence of the Taupo eruption was actually all around us, but we didn't have the knowledge that enabled us to use what we saw to interpret the events. The vast pumice beds around the lake were, themselves, such evidence. It is believed that the lake was already in existence, in some form, at the time of the AD186 eruption, and that this eruption was but the most recent of many. The lake itself is a giant volcanic crater, caused by a vast explosion of awesome proportions.

What happened in 186AD is almost beyond human comprehension, especially when one looks at the clear waters of the lake today. Some of the 'numbers' associated with the event almost defy imagination. Let me cite the first of these: it is estimated that during the 186 AD eruption around 104 cubic kilometres of material were ejected from the primary vent, believed to be somewhere in the northeastern quadrant of the lake. This volume of discharge material – in essence equivalent to a block of geological material a kilometre square and 104 kilometres long – is to me almost incomprehensible and that’s just the first of these staggering numbers. We don’t know how long this eruption took, but, whatever the time scale, it must have been a fearsome event. Geologists write of a closely spaced series of eruptions, the last of which was seemingly a simply huge explosion, driven in part by the waters of the lake plunging down into the eruption crater, and they estimated that about 10 cubic kilometres of material were blasted out of the crater in just a few minutes. Imagine it, if you can! No one lived in New Zealand then (as far as we know), so no one actually observed the event, or even its local consequences, probably for hundreds of years, by which time most of the eruption zone had probably been revegetated in much the same way as it is today. This obscures the more obvious consequences for all but informed geologists, and Māori had none of these! Material ejected from the crater was of two broad kinds – ignimbrite, which is a kind of molten rock – was discharged, flowed radially, and eventually cooled to form a zone radiating out from the centre of the eruption in a ring in all directions around the lake for 70-90 kilometres, and at speeds estimated as 600-900km per hour (try to imagine that). The speed of this flow was enough for magma (mobile, molten rock) to flow over mountains more than 1500 metres higher than the general landscape, and so over peaks in the Kaimanawa Ranges to the east, and over Mt Tongariro to the south of the lake. The collapsing eruption plume, and the molten rock ‘rivers’ deriving from the volcanic discharge, created radial winds so strong that entire mature forests were blown over and in the Pureora Forest to the west of Lake Taupo botanical geologists (or geological botanists) have uncovered phalanxes of well grown forest trees, all lying in parallel, presumably indicating the direction of these incredible winds.

Other material was pumiceous and ash, or tephra, and so much lighter, and exploration of the soils around Lake Taupo and especially in the areas to the northeast of the lake, towards East Cape, shows simply massive deposits of volcanic tephra covering perhaps 30,000 hectares, the northeastern emphasis being interpreted as indicating that there were strong winds from the southwest at the
time of the eruption. Geological oceanographers have found evidence for the eruption, on the sea bed hundreds of kilometres east of the North Island, a silent testament to the extent of the eruption. Estimation of the volume of the discharge comes, essentially, from calculations of the amount of material deposited, to which must, of course, be added the amount that was more widely dispersed as it was flushed out to sea from the deposition zones.

For those of us interested in the fish life of the lake – it does not take much persuading that all life in the lake must have been exterminated – if there was any life there. It is said that after Mt Tarawera erupted in 1886, the water in Lake Rotomahana was coloured like 'pea soup', and what happened at Tarawera was a very tame affair compared with the Taupo eruption. What was left of Lake Taupo was undoubtedly a filthy, toxic mess in which no life could have survived – finito can be the only word for it, and probably for decades, if not centuries afterwards. In the 1900s, it would be found that the pumice soils around Lake Taupo lacked essential minerals (especially selenium) for successful stock farming and this is one of the enduring outcomes of this great eruption, nearly 2000 years before.

We would be seriously underestimating the implications for aquatic life of this stupendous event if we restricted our consideration of impacts to just the waters of Lake Taupo itself, or even to just the lake and the rivers flowing into and out of it – which would, of course, have been impacted in a major way. In addition, there would have been absolutely devastating flushing flows of highly toxic, ash and pumice-filled floods down virtually all of the river systems that radiate around the central North Island, to all the points of the compass and I have no doubt that these floods would have exterminated all life in these rivers, as well, except, perhaps, some of the lower tributaries whose catchments had not been smothered with ash – not just in the area where there had been ash deposition, but also downstream in these river systems as far as the coastal seas, and impacts can be imagined at least in the seas around the rivermouths. There is evidence that had they been in existence at that time, towns like Napier and Wanganui would have been buried by the floods. The Waikato River that drained Lake Taupo would have been a major conduit of volcanic ash, from its source to the sea – and the position of its outlet to the sea varied over the centuries, sometimes discharging as now into the Tasman Sea to the west of Hamilton, but at other times discharging into the Hauraki Gulf, with several shifts back and forth identified by geologists. I suppose, by doing so, the Waikato River shared its toxic, turbid brew with various parts of the North Island’s coastal environment. How long this might have continued can also only be guessed at, and they would be wild guesses.

I think we can conclude that, in addition to impacts on life in the lake, all life in such rivers as the Waikato, Whanganui, Whangaehu, Rangitikei, maybe the Mokau to the west, probably the Ngaruroro, Mohaka, and others of the eastern North Island, and those in an arc to the east and north as far as East Cape and the Bay of Plenty, would have suffered some severely harmful impacts. Readers will be aware of the damage wrought by the lahar originating on Mt Ruapehu causing the Tangiwai disaster in 1953, and have some appreciation of the more recent breakout from the mountain’s crater lake and how this impacted on aquatic life in the river. Fewer will be aware that the perennial discharge of toxic waters from the mountains of the central North Island are enough to seriously limit the variety and distribution of fish that live in the contemporary Whangaehu. Impacts of the Taupo eruption would have been several orders of magnitude more devastating.

How, then, did Lake Taupo come to seemingly have such a rich stock of native freshwater fish life so important for Māori communities, who have lived there for perhaps a thousand or so years? We can imagine that gradually sediment in the lake's water would have partially settled onto the lake bed, and rain falling on lands around the lake, and eventually draining into the lake from the surrounding countryside, would have sluiced toxic materials and ash from the riverbeds into the lake and eventually downstream to sea. There would have been occasional incidental floods that would sweep ash from the rivers' catchments, and these, too, would have found their way into, and eventually through, the lake. As the landscape became vegetated, the stability of the primitive soils would have increased and there would have been incremental improvements in water quality. In the big 1958 Taupo-Tongariro flood (about which I wrote long ago in Fish & Game New Zealand, Issue 25, 1999), there was evidence
for substantial erosion of volcanic, pumiceous soils from lands around that lake, providing just a faint hint of what would have been happening repeatedly over nearly the previous 2000 years. Eventually, we may assume, conditions in the lake would have become congenial for plants and animals to live there. We can scarcely even speculate about how the lake’s biological communities developed, though initially some phytoplankton species (tiny unicellular algae) must have arrived and also the algae (often diatoms) that grow on the rocky lake bed. These would have provided food, perhaps soon afterwards, for some small crustaceans – “water fleas” to the uninitiated, and perhaps the common little black ‘mud snail’ (Potamopyrgus) – which would have found their way into the lake, perhaps carried by aquatic birds, or their resting-stages blown there in the wind. But given the extent of damage around Lake Taupo, the colonising species must have come from some distance and the process may have been quite slow, taking decades or longer. Lots of aquatic insects, like mayflies, caddisflies, stoneflies, dragonflies, chironomid midges, and sandflies, have flighted, terrestrial adults, which could have flown, or been blown into the lake and, gradually, over the decades, or perhaps even centuries, biological communities would have become established. Probably, there were a few, perhaps many, false starts, and the developing fauna and flora may have been exterminated, perhaps again and again, by the flushing of additional loads of toxic materials into the lake. The various animals, especially, could only become established as suitable food resources entered the lake, and we can be sure that the first aquatic insects and crustaceans to become established were species that depended on plant life in the lake for food. As the communities of such herbivores developed, there would then be scope for predatory insects to establish themselves.

But, what about fish in the lake? Māori depended for food very heavily on the simply prodigious populations of kōaro (Galaxias brevipinnis) that they harvested from the lake – reportedly by the “hundredweight”. How did they get into the lake? Also koura (Paranephrops planifrons) were once hugely abundant there, as Māori well knew, and we need to ask how they, too, reached the lake. Common bullies (Gobiomorphus cotidianus) are also now abundant there, as are freshwater mussels (Hyridella menziesii). There are several ways that these animals could have reached the lake and, to some extent, we can only speculate. One way could have been that, eventually, various of these species were able to invade upstream in the rivers radiating out from the central North Island and that one or more headwater stream-capture events involved high elevation tributaries that had populations of these native fish. If these were diverted into the Lake Taupo catchment, their fish would have had access to the lake – most probably the upper Whanganui River, to the southwest, or perhaps the Rangitaiki River to the northeast. The most likely candidate fish species for such an event is the kōaro, which is found today in the upper headwaters of the Whanganui River, but the same could have been true of koura, which are known from streams high on the slopes of Mt Ruapehu. Such events are less likely for either common bullies, or fresh water mussels, which were probably present in far inland river systems near to the Taupo catchment. An alternative possibility is that various of these species were transported to the lake by early Māori, for whom there is a tradition of translocating aquatic life around the countryside, with legendary figures like Ihenga, Ngatoroirangi, and Hatupatu being credited with doing so. And though Māori legends may attribute such events to these pioneering Māori explorers, it does not necessarily follow that this is exactly what happened, as legends may have variously described explicit events only as actual background. We will probably never know, though there is some potential for beginning to understand this intriguing story using DNA sequencing technology, which might, just, provide us with some hints about how many individuals were involved in the propagules involved in originally colonising the lake.

Whatever actually happened, we can be sure that it was the establishment of these species that made it possible for early Māori communities to become established around the lake. So, these dramatic volcanic events form the background to the contemporary lake, where so many of us have found rich pleasure over many years, the lake's indigenous fisheries for early Māori communities, for modern New Zealanders, and visiting tourist anglers enjoying trout fishing there, and endless others who just value the lake for its changing beauty across the seasons and the moods of weather.
Could it all happen again? There is little doubt that it might. Few will realise that Mt Egmont some distance to the west of Lake Taupo last erupted in a major way only about 300 years ago and similarly that Rangitoto, near Auckland, erupted even more recently – perhaps only 225 years ago, and so both well within Māori colonisation. We all know of the 1886 Tarawera eruption. White Island persists in rumbling out in the Bay of Plenty, and a significant, unpredictable volcanic eruption on Raoul Island led to the death of a Department of Conservation officer not too many months ago. There is no escaping the fact that New Zealand’s islands sit astride the junction between the Australian and Pacific tectonic plates and that we live in an area of violent change – evidenced by continuing earthquakes and geothermal activity. New Zealand’s history of human habitation, little more than a thousand years long, is just a moment in geological time. Just as we are warned that earthquakes are an inevitable but unpredictable consequence of life in New Zealand, much the same can probably be said for volcanic activity. The much valued trout fisheries of the central North Island, Taupo, the Rotorua lakes, and perhaps also Lake Waikaremoana, are all at risk from potential volcanic activity, which is simply unpredictable.

I suppose we might want to be able to watch and wonder at such awesome events happening, though the risks would be huge. A peep at a full scale eruption emerging from Lake Taupo would make a good story for our grandchildren, but it would be at great cost, including the almost certain loss of the Taupo trout fishery!
4.9 Another damned lake

Fish and Game 59, 2008

R M McDowall reckons anglers will just have to sit back and see what Mother Nature delivers in regards to impacts on fisheries in and around New Zealand's newest young lake.

The formation late last August of a small lake in the north branch of the Young River in Mt Aspiring National Park created a bit of news, and people are no doubt wondering what its fisheries implications might be. They could, I suppose, be both negative (having adverse impacts on the existing fishery), or positive (providing a new lake having some fisheries value). For those who don't know much of South Island geography, the Young drains the eastern flanks of the Southern Alps and joins the Makarora River further upstream than the better known Wilkins River, the Makarora being the major river draining into the head of Lake Wanaka alongside which you drive through some wonderfully beautiful beech forest on the way to the Haast Pass. I used to love driving up there before it was sealed, as it had a damp dirt surface, and the driving was almost noiseless. I did the drive heaps of times on my way to the West Coast. Now you have the thunder of tyres on coarse-chipped bitumen and it's not quite the same.

There has been discussion about what the new lake might be called. Given its age, and the river system in which it formed, I think calling it the Young Lake might be a nice pun, that's if a pun can be ranked as nice! That's a question for the New Zealand Geographic Board to resolve. The lake was formed by a landslide from steep topography in the river valley. This sort of thing has probably happened often in the history of New Zealand's young (!) rugged mountains, although the record shows that most often this has been a result of earthquakes, something that has not been suggested for the Young. It seems to have just been a result of some weaknesses in the soils and geological formations in the valley, perhaps accentuated by heavy rainfall – though, of course, it is possible that past earthquakes have loosened up the rock and made it vulnerable to slippage. It's likely that most lakes formed by landslides, like this one, have a relatively brief existence, as once the valley behind the landslide is filled with water and the lake overtops the debris-dam that forms it, erosion soon scour it away and it empties. It depends a lot on the material involved in the landslide. Official fears that this might happen in the Young is obvious from DoC closing the valley to trampers – as it is quite possible that erosion might happen very rapidly, leading to a dangerous wall of water pouring down the valley. However, in this instance, early fears of collapse of the dam seem to be allayed, and some very large boulders involved in the natural dam, make rapid emptying less likely, though I suspect that it is still possible. It is possible, too, that leakage through the debris dam might jeopardise its long term survival. We'll have to wait and see what happens.

The record of what has formed the many lakes around the New Zealand landscape suggests that heaps of them were formed by landslides, but mostly relating to earthquakes. We can't be sure, but a list of landslide-dammed lakes suggest that there are lots of these. Many were formed in the 1929 Buller earthquake, though most of them didn't last long and were washed out within days or weeks of the event. One survivor that is attributed to an earthquake is Lake Matiri in the upper Buller River catchment, and that is a quite substantial lake. But there are also a few lakes that seem to have been formed by other sorts of landslides – Lake Chalice in the Wairau River in Marlborough is perhaps one, and Lake Christabel in the headwaters of the Grey is another, and both are regarded as quite old. Chalice formed more than 2000 years ago and Christabel maybe 1000 years ago. Lake Kaniere is another possibly landslide-formed lake and is much older still. How can we know? I'm not sure, but it could be based on aging old tree stumps involved in the dam, or perhaps from an even age of trees in the forest that surround the dam. Foresters have invested a lot of effort in determining the ages of past New Zealand earthquakes from what is called dendrochronology, which is just a fancy word for aging trees from their growth rings. And they have found stands of trees, all of much the same age, in places where it looks as though there has been some kind of a landslip in the past. I remember an earthquake in Fiordland a few years ago, when television footage showed great bands of landslides with exposed soils and rock faces, and these will all, eventually, be re-colonised by trees giving patches of forest with trees of uniform age. From this, it is possible to make assumptions about when the slip happened. If lots of them happened
at the same time, it is possible that an earthquake was involved, though that doesn’t rule out some kind of torrential rain storm. All that aside, given our history, the long term endurance of the Young Lake is uncertain, and it may not last for long.

Should it survive, all sorts of ecological processes begin that derive from the lake’s formation. Firstly, of course, the lake fills mostly with highly turbid water and it’ll take a while for the sediment to settle. That means that there may be a significant layer of silt on the lake’s bed, which will have ecological implications and affect the lake’s ‘bottom fauna’. That will gradually dissipate, especially in the shallows subjected to wind-driven turbulence. There will eventually be a distinctive assemblage of insects and crustaceans in the lake that will be quite different from what would have been in the former river, and the insect fauna of the lake will be very sparse, certainly for a while and perhaps a long time. Large numbers of trees are submerged, or partially so, as is obvious from television footage of the lake. These, as well as smaller plants below the forest canopy, and also leaf litter lying on the floor of the forest, will result in leaching of all sorts of nutrients in the lake, though the biological impacts of these nutrients will depend, among other things, on the life of the water in the lake – i.e. on how quickly the water in the lake is replaced by inflow and outflow (which are, of course, equal: what comes in must go out). Again, from television footage, it looks as though the lake, though long, is narrow and has steep sides, so its volume is quite low and replacement of the water rapid. If the lake survives, it will take a long time for all the woody-debris associated with the forest to rot away – decades, probably.

Biologically, there has been a dramatic change in the habitats available to animals in what is now the lake and, in particular, what was once a fast-flowing, boulder-cobble river is now a several kilometre long pool. I am unaware of any records of fish from the entire Young River catchment, but there will probably be rainbow trout up there. If any native fish have survived past trout predation in the river, they will be kōaro, and I’d expect to see occasional kōaro in the swift-flowing boulder-cobble streams in the upper catchment. Ancestrally, there were probably longfin eels there, but since the dam was built in the 1950s at Roxburgh, a long way further down the Clutha River, eels have not been able to penetrate further up the river, and the Clyde Dam has since further isolated the upper reaches. Eels used to be in the upstream lakes, as there were once quite valued Māori eel fisheries in Wanaka and Hawea, and it is just possible that there are longfin eels in the river that date back to before the Roxburgh dam. Longfin eels can live for many decades and there may still be some big old females in the tributaries of Lake Wanaka, like the Young.

Because of the nature of the dam, it is likely that the fish populations upstream of the landslide will be isolated from populations downstream. Depending on the eventual porosity of the dam material, it is even possible that eventually, water may leak through rather than pass over the dam, as is true of Lake Christabel, except at times of flood flows. But, if a decent stream forms across and downstream of the dam, some movement of fish between the lake and the river downstream may be possible. It’ll all mean that there may be lake populations of rainbows and kōaro in the lake, though my hunch is that the replacement rate of water in the lake will be so high that there won’t be suitable habitat for the larval and juvenile life-stages of kōaro in the waters of the lake itself. There could be two effects. Firstly, any kōaro larvae that would be produced in the upper, forested tributaries of the new lake, would be carried down through the lake, into its outlet stream, and so into the Makarora and eventually into Lake Wanaka, just as would have happened before the landslide. Also, the same high replacement rate of the lake’s water will almost certainly mean that there will not be suitable planktonic foods in the lake for the young kōaro to live on, and this alone will mean that the lake probably won’t support the kōaro. There could be some recruitment of young kōaro back into the lake, originally from Lake Wanaka, and upstream via the Makarora and lower Young, if they can penetrate across the dam, and kōaro are amazing climbers. Otherwise, eventually, any kōaro populations upstream of the lake will gradually die out.

Rainbow trout will probably be affected in a different way. They are less likely to move downstream out of the lake, or for that matter to move upstream into the lake from the lower river. Development of significant Young Lake-based rainbow trout populations is unlikely, as the lake is unlikely to be
sufficiently productive to support a significant stock of rainbows. This may mean that any rainbows upstream of the dam will probably eventually only be small, river-reared fish, rather than larger, Lake Wanaka-reared fish, as before the landslide. So don’t expect a significant fishery. Also, if the dammed branch of the Young was ever in the past a significant contributor to rainbow recruitment in Lake Wanaka, there is likely to be some loss to the Wanaka population, though this seems to me unlikely to be of major significance. I rather doubt that spawning recruitment from the impounded branch of the Young is a major or critical determinant of the lake’s trout stock.

I had a quick talk to Martin Unwin about whether the Young emerges as a significant trout fishery in the Fish & Game angling survey that Martin manages, and he told me that there is some recorded interest in the river as a trout fishery, generally. He related how a young American colleague, who was out here a few years ago doing some work on our Chinook salmon, was up in the Young trout fishing and had a somewhat unpleasant experience when a helicopter arrived with a fishing guide and tourist, and the guide quietly told our colleague to ‘piss off’ – as if he and his tourist had some kind of priority access to the river. So much for the pleasures of ‘peace and solitude’ and ‘wilderness trout fishing,’ and I’m sure that this was not a unique experience among local anglers. This rather negative encounter aside, it seems that there has been a worthwhile trout fishery in the Young and so the branch that has been dammed by the landslide probably had some value as habitat for trout spawning and juvenile recruitment. That may be no longer true!

Where to from here? We just have to sit back and see what Mother Nature delivers. What is going to happen may happen, and soon, or it may take years or even decades for the valley to stabilise, with or without the young (or is it Young?) lake.
4.10 A matter of opinion

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R M McDowall weaves a story he knows may upset many, if not all trout fishermen, but it is a side of New Zealand’s acclimatisation history that deserves telling nonetheless. Some will ask, why even raise the sensitive subject of adverse impacts of introduced species on native ones? Who’s to judge if a native species is better than a non-native species? Why is nativeness so important anyway? Why should we care?

I imagine that anglers reading this article will react with either disbelief or outrage, asking how anyone could even ask, as I will here, if trout have worn out their welcome in New Zealand? but I am dead serious. I recall an article in Fish & Game New Zealand a few years ago, where Ben Wilson from Auckland/Waikato Fish & Game expressed some strong views about the question of the rights for anglers to have trout populations and trout fisheries management in waters in National Parks. And for me, this, to some extent, epitomised questionable policies relating to what are essentially alien species within National Parks. Under the National Parks Act, there is provision for the elimination of non-native species from within park boundaries aimed, I suspect, primarily at noxious weeds and pest species. However, I think that in terms of conservation of indigenous species, widespread acceptance of salmonids in National Parks is at best an anomaly that we need to address with some care. Official attitudes towards sports fish, such as trouts and salmons, and also game animals like wapiti, chamois, and tahr populations, in National Parks have been distinctly ambivalent at times, and a cause for some robust debate. It seems plain, to me, that the final word on these issues has not been heard.

In addition, there are other instances that I think need some careful examination and clarification of both policy and practice. One example that I often cite was in about 1975-76, when the Wildlife Service proposed culling of eels in Lakes Fergus and Gunn in the upper Eglinton Valley of Fiordland National Park in an attempt to protect seriously declining stocks of Atlantic salmon. The prospect of removing an indigenous species from habitats in a National Park, to favour survival of an exotic species, is a paradox of some significance and the National Parks Board refused the request – as I think it should have. The irony of this circumstance is intensified by the fact that against advice and substantial angler opposition, the Wildlife Service had liberated rainbow trout into the Waiau River system in Southland in the late 1920s and it seems possible that a decline in the Atlantic salmon population in Lakes Manapouri and Te Anau may have been a result of adding rainbow trout to the ‘mix’ of salmonids there. For this reason, the Wildlife Service crying about a decline in Atlantic salmon in the system seemed to me a bit like ‘crocodile tears’, but I stray a little from my purpose in writing this article.

Everyone knows that brown and rainbow trout, in particular, have been hugely successful in our cold water rivers – a consequence of habitat suitability, including plentiful, gravelly spawning streams in most catchments. And though in a few waterways there is a need for stocking to maintain fisheries owing to the absence of such spawning habitats, in general the populations are largely self-sustaining – as long as habitats do not deteriorate from pollution and damaging impacts on stream substrates.

When first brown trout, and later rainbows were brought here, the populations thrived beyond even the wildest dreams of anglers. Soon, large bags of huge trout were being caught. The effort invested in getting trout established in remote waters was substantial, with mention of them being transported by horse to waters like Lake Wakatipu in Central Otago and, of course, Lake Taupo in the central North Island. Farmers on remote farms obtained stock from the acclimatisation societies, and carefully released them into streams that flowed near their farms. The early settlers were keen to see the fish well-established and very soon they were.

In addition, and especially with brown trout, the stocks rapidly spread, almost certainly because some fish went to sea (behaving as ‘sea trout’), to feed and grow. Many of them probably homed back to the streams where they were born, but others spread around the country through coastal seas and invaded river systems where trout had never been liberated. Some waterways were inaccessible to such sea-migratory trout as a consequence of falls or torrents, but a bit of human help probably overcame most
such limitations and brown trout were soon widespread in virtually all suitable waters.

It was different with rainbows and these have remained rather less widely distributed. Some have suggested that, like brown trout, rainbows have sometimes migrated to sea and later returned to freshwater. But I know of no evidence for this happening at any significant scale and there has been little natural spread of rainbow trout around coastal seas, or their natural establishment in waters where they were not released. In fact, I know of no rainbow that has been proven to have returned to New Zealand rivers after having been to sea. And so brown trout are far more widespread than rainbows, the latter predominating in large inland lakes and in the upper reaches of a few of our large river systems.

The success of these two trout species in New Zealand waters is perhaps not surprising, given the quality of our, clear, cold gravel rivers and associated inland lakes. Anglers and fisheries administrators were soon euphoric about the huge stocks of large trout becoming available to anglers, perhaps best illustrated by the comments of pioneering Taupo Presbyterian parson Henry Fletcher, who stated, in 1919: “The existence of trout in the lake (Taupo) is taken so much as a matter of course that some people can hardly realise how extremely recent the advent of these beautiful fish is…they were then thriving in a most amazing manner.” This led Fletcher (1919b: 367) to enthuse: “It seems almost incredible that the swarming myriads of fish in the lake could be the result of only a few years increase, yet such is the fact.” Anglers could catch huge bags of very big trout in a way seldom known anywhere in the world.

Similar comments were made by others, relating especially to trout fisheries in the central North Island, but it was not entirely there. Anglers all around the country became excited at the trout fishing becoming available, as for those in North Canterbury fishing around the brackish/lowland Lake Ellesmere; or as shown by the writings of George Mannering, who fished widely around the country, or William Spackman, author of the first book on New Zealand trout fishing published locally. Proliferation of the newly liberated fish and their growth rates were probably unprecedented and before long the lakes of the central North Island had a reputation as recreational trout fisheries of the highest calibre. Anglers, both local and international, were soon fishing there, including American novelist Zane Grey, who camped on the Tongariro River, and the Duchess of York (later Queen Elizabeth as wife of King George VI) after whom the Duchess Pool is named. The Lake Taupo trout fishery reached a zenith around the beginning of the 20th century.

However, especially in the big North Island lakes, the bonanza was soon over, and some of the lakes quickly became seriously overpopulated by very large numbers of trout in increasingly poor condition. The change in the size and condition of the trout was the first indication to anglers that the fish had eaten themselves ‘out of house and home’. The trout were super-abundant but starving, and anglers began to complain that the formerly abundant huge fat trout had been replaced by even more abundant but much smaller, skinnier fish. The reproductive rate of the trout population was clearly greatly exceeding the capacity of the lake to fuel the growth of the fish and to maintain them in good condition.

Some further measure of how abundant kōaro once were in Lake Taupo can be obtained from the observations of Henry Fletcher, when travelling across the lake, and passing through what he assumed was an ‘enormous shoal of trout’. Taupo doctor, John Armstrong, would later contrast these observations of Fletcher in the early 1900s, and his own, noting that by 1935 ‘one rarely hears of even a single trout rising in deep water’ and, his later lament that ‘more remarkable still has been the almost complete destruction of Galaxias (brevipinnis) in the lake…the trout rapidly brought about its complete extermination in the deeper waters of the lake’. Armstrong deduced that the rising fish that Fletcher had seen were not trout, but more probably ‘Galaxias feeding on Chironomus (midges), and accompanied and attacked by the trout’, and he may have been right.

In ecological terms, it is simply impossible that such growth and proliferation of an introduced predatory species could have happened without impacts on the lakes’ biological communities – and there were impacts, major ones. Anyone giving the matter even a few minutes thought could conclude that something had to be ‘driving’ the astonishing proliferation of our trout populations – and it takes little
insight to recognise that the ‘energy’ for this to happen had to come from somewhere. In ‘aquatic-ecosystem’ terminology, this energy was, of course, the food that the trout consumed to fuel their almost incredible growth. Putting it quite plainly, it was simply impossible that large predators, like brown and rainbow trout, could be introduced into natural ecosystems like Lakes Taupo and Rotorua without some adverse impacts on species already present that provided food for the trout.

And there were serious, adverse, impacts on the lakes’ natural ecological values, though it is, I suppose, a matter of opinion as to whether these adverse impacts mattered. Certainly, for some people, and particularly Māori living around the lakes, these impacts did matter, because the native fish had provided a food resource of long-standing traditional value to Māori. But before we look at this aspect, let’s first explore the nature of the impacts. I will focus substantially on lakes of the central North Island and for several reasons, though primarily that the impacts there seem more explicitly understood.

It seems clear that during the late 1800s and early 1900s, Māori communities around the lakes did not support the establishment of trout and would soon be lamenting these impacts. Rotorua historian Don Stafford asserted that: “In fact, the Māori would probably have preferred his original lake food, inanga and koura…”

Wi Pere, MP for Eastern Māori in the early 1900s, regarded the trout as inedible, complaining that “so far as the Māori taste and desire is concerned, they are not fit to eat,” a comment perhaps related primarily to the time when the lakes were heavily overpopulated with trout that were in poor condition. Wi Pere thought that “the Pakeha fish should be destroyed, and they should not be allowed to propagate, because they destroy the inanga, the kōkopu, and the tuna”. He complained that Māori had to buy licences for fish “that are absolutely no good…” and, on behalf of Te Arawa, that fishing rights that they had held “from time immemorial” had been disturbed by introduction of exotic fish. Te Arawa were aggrieved that exotic fish were depleting the native fish stocks, which had traditionally been an important food source for Māori. Wi Pere was not a lone voice. Maui Pomare, another noted Māori MP, stated that “the Pakeha’s trout ate out the Māori’s kouras and kōkopus” in Lake Taupo. Pakeha MP for Ohinemuri, a Mr Samuel, recognised that trout introduced into Lake Taupo “by and for European colonists such as himself, had considerably damaged the indigenous Māori resource”, and “as we have taken the native food out of the lakes by the introduction of imported fish, which are very ravenous and which feed on the indigenous fish, it is only right that we should compensate them for this loss and for any infringement of property rights”. Pakeha Gilbert Mair, who spent much of his life among Māori, especially around the central North Island, agreed, especially when the condition of the trout had deteriorated seriously, stating that: “These European fish swarm in these lakes so numerously that they are unfit for food, and merely serve to give sport (so called) to tourists in knickerbockers…”. Not only had Māori lost their traditional fish stocks, and moreover disliked eating trout, but also the arrival of trout in the lakes provoked a series of legal issues for Māori, relating to their need to purchase angling licences to fish in what Māori argued were their lakes (and history would show that, indeed, Māori did own the lakes, despite denial of this by the colonial government of the early 1900s).

Most of the detailed historical documentation of the value of the indigenous fisheries in the lakes relates to the kōaro, or lake whitebait, about which there is repeated reference in the literature (using various Māori names such as ‘kōkopu’, ‘inanga’, ‘maehe’, and various scientific names, but we are talking about the kōaro, Galaxias brevipinnis). There are lots of references to traditional fisheries for kōaro in these lakes, of Māori taking this fish by the ‘hundredweight’ (112lbs, or c. 50kg) using huge seine nets around the shores of Lake Taupo, or between canoes in mid-lake. Early reports tell of kōaro being so abundant in Lake Taupo that they were “washed up in cart-loads on the shores of the lake” and Māori could walk around leeward shores after major storms and collect adult kōaro thrown ashore by the waves, enough to constitute a recognised food source. These people were sometimes referred to, in Māori, as “kai pangare” – those who picked up their food around the lake shore. Māori kuia, Makeriti, explained that “the people who lived inland had an enormous supply” of these various lake foods “until the Europeans introduced the trout and other fish”. Johannes Andersen (1946: 149) wrote of kōaro being “once netted by the ton” from the lakes. Another Māori named Tamati Kurupae told of being “out in our canoes and
along the shores day after day catching fish from the lakes’. Gilbert Mair described Māori catching a tonne of kōaro overnight from a trap in the Hamurana Stream at Lake Rotorua – yes, that is, overnight! The abundance of kōaro and their value as a food for Māori is incontestable. If catches like these were possible, the kōaro populations in many of these lakes were once clearly immense: the kōaro was a highly prized food and Māori harvested them in huge quantities, sometimes as lake whitebait (‘inanga’), but also as adults (‘kōkopu’), using seine and trap nets and other gear. This fish was an absolutely important part of the diets of Māori living around these lakes and I strongly suspect that it was kōaro that made it possible for Māori to live around these inland lakes, remote from marine fisheries resources available to coastal communities.

To further highlight the significance of these foods to Māori, we should note that hospitable Māori living around these lakes often offered meals of ‘whitebait’ or ‘inanga’ to Pakeha coming to visit or passing through, especially those who visited or lived in the Taupo district in the mid 1800s – people such as explorer John Bidwell, scientist Ernst Dieffenbach, geologist Ferdinand Hochstetter, missionaries Richard Taylor and Thomas Grace, Governor George Grey, Bishop George Selwyn, and others.

The abundance of kōaro in the lakes soon disappeared once the trout arrived. Interestingly, Henry Fletcher said that he described his observations from the early 1900s “…in the past tense, for the old methods of catching fish are practically extinct. It is only some of the old men who can explain the use of their old implements…introduction of trout to the Taupo Lake put an end to the native fish and methods of catching them”. John Armstrong in the 1930s lamented the loss of kōaro from the lake, mostly because he thought that “this free-swimming fish develops a more sporting tendency in the trout than its successor the shore-loving toitoi (or common bully)… (also) the great food supply that is produced by the hatching of the large Chironomus (midges) all over the lake probably now goes to waste”. Thus, according to Armstrong: “In shallow waters round the edge of the lake, the shoals of Galaxias may still (in 1935) be seen (though they cannot, much, today), but harried by the shag, and in active competition with the young trout for the available food supply, they are steadily decreasing in numbers.” Note that this was at a time when there had been trout predation there for several decades. The loss of a centuries-old food supply for Māori living around the lake did not even feature in Armstrong’s assessment.

These sorts of adverse impacts of introduced species on native ones had long been predicted. We should note Charles Darwin’s impressions when he was in New Zealand on HMS Beagle for several weeks in late 1835. Insightful as he always was, Darwin recorded concern about the impacts of proliferating exotic species on the native fauna and flora. We can read in Darwin’s “The origin of species” that: “From the extraordinary manner in which European productions have recently spread over New Zealand, and have seized on places which must have been previously occupied, we may believe, if all the animals and plants of Great Britain were set free in New Zealand, that in the course of time a multitude of British forms would become thoroughly naturalised there, and would exterminate many of the natives.” He did not mention freshwater fish, if for no other reason than that none had then been introduced. But his concerns about the potential impacts of introduced animals and plants on indigenous species were prophetic for the fish fauna, as much as for ecology and conservation generally in New Zealand.

But, as early as 1873, only six years after brown trout had arrived here, noted 19th century colonial naturalist Frederick Hutton observed that New Zealand’s freshwater fish fauna had evolved “in the absence of large rapacious fish preying on the smaller ones”, and he recognised that introduction of salmonids would end the historical absence of large fish predators. This was presumably on the basis of his concern that the salmonids might have adverse impacts on the smaller native species, though he did not explicitly say so. But he did suggest that formal description of all native fish occurring in our rivers “should be a most valuable contribution to science as materials for future naturalists”. Hutton clearly feared for the survival of the native species and he was so correct.

As Gilbert Mair later put it for the Rotorua lakes: “Through the introduction of trout, (the Māoris’) bounteous food supply of native fish (the ‘inanga’ and ‘kōkopu’) has been destroyed.” Also, as a
newspaper editorial as early as 1896 put it: “The koura, inanga and carp are fast falling prey to the larger fish, and shags innumerable may be seen hovering about the mouths of the various streams on the lookout for the smaller fry.” And it was suggested that “…it becomes a question of how we are going to stop their (i.e. the trout) predations… the trout fed so voraciously” that the native species “were rapidly disappearing…”

There is repeated comment virtually throughout the literature on the central North Island lakes about the adverse effects of trout on the native fish stocks. Representative of the views of many observers of the late 19th and early 20th centuries is Gilbert Mair’s comment in 1923 that “…of course the introduction of trout was the death knell of the kōaro, and I very much fear that they will be destroyed utterly in Rotoaira Lake, in like manner…”

Tuwharetoa Māori had traditionally particularly valued the native fishery for kōaro in Lake Rotoaira, and had “never intended that trout should be put in it as they wanted to preserve the kōaro”. As MP Maui Pomare observed: “The Tuwharetoa tribe had a little lake called Rotoaira and they had a native fish called the kowaro (sic). But what happened? Some of our acclimatisation friends – I will not say who – went there surreptitiously at night and put trout into the lake which had been reserved for native fish…” And so, in lake after lake, trout were introduced with the same impacts on the native fish. All of the above may be just ‘interesting’ from the perspective of aquatic conservation, but for the Māori people living around the big North Island lakes it was rather more concerning. By the late 1800s, it had become a matter of getting enough of their traditional foods to eat.

When considering issues relating to trout, we need to recognise that impacts have, of course, not been entirely harmful – in the early years, trout were a substitute food for Māori, but before long a decline in the condition of the trout led Māori to complain that they were ‘inedible’ and that they did not compare to the native fishes. Trout do, now, provide a much valued outdoor recreational asset from which many New Zealanders, both Māori and Pakeha, gain great pleasure. But that was no solace to Māori in the late 19th and early 20th centuries, who bore the brunt of the adverse impacts of trout predation on human populations. They were never consulted about introduction of the trout and it is clear that, at least for some, their impacts were deeply regretted.

So at a very early date, Māori leaders began to complain about their loss of a traditional food resource. Although it is hard to determine explicitly when the Māori populations began to notice these ecological impacts, it seems to have been well before conclusions were reached by anglers and/or the government that the deteriorating trout stocks resulted from a loss of their food species. There was a whole cascade of consequential impacts, ecological, conservational, cultural, dietary, and statutory, and at base, I suppose, one might argue that the Māori were as hungry as the trout – and were in ‘head to head’ competition for the populations of kōaro. The trout were getting the ‘first cut’ and Māori were clearly losing.

Over a longish period during the late 19th and early 20th centuries, complaints by Māori focussed on the impacts of the introduced trout – as Māori, especially around Rotorua lakes, realised that trout were having seriously adverse effects on the native fish, and as they found themselves deprived of a much-valued traditional food resource. Te Arawa Māori were angry that the government had allowed introduction of foreign species, such as trout, into their lakes and without their consent, or even any consultation, because of the impacts of the imported fish on the indigenous species that had been so important to them for centuries – though it has to be recognised that the levels of success of the trout had not been predicted, nor had their impacts on native ecosystems – except, perhaps, by Charles Darwin and Frederick Hutton (no one else had even thought about this). Viewed objectively from today, in terms of their ecological impacts, introduction of trout to New Zealand was little different from the introduction of rabbits, or stoats, though anglers may take offence at this seeming slur on trout; maybe introduction of deer, again by acclimatisation societies, would be a better comparison.

MP Wi Pere complained on behalf of the Arawa people that their fishing rights had been disturbed by the introduction of exotic fish and that Māori were aggrieved about the impacts of the exotic fish. He described “these pakeha fish (as) lean things and not fit to eat, and I should tell you that the only fish fit
for food in this country are the inanga, the kōkopu, and the tuna; these are relishable food and good to eat”. Gilbert Mair, commenting on the Māori people at Rotorua, found that the arrival of the trout had resulted in Māori being “sometimes on the verge of starvation….Through the introduction of trout, their bounteous food supply of native fish has been destroyed….The position of Natives in this district is worse than it has ever been and they are absolutely without hope”.

The Stout-Ngata Commission on Māori land sat in Rotorua around 1908 and its interim report on Native lands of the Rotorua County observed that “it could not be denied that Te Arawa had ‘suffered a grievous loss by the destruction of the indigenous fish’ by trout”. In a review of Māori freshwater fisheries, mostly in the Rotorua district, Māori anthropologist Te Rangi Hiroa wrote: “In pre-trout days the lake teemed with food which to the Māori was far more appetising than the trout which has displaced so much of it.” He commented that koura in the lakes had survived the impacts of trout better than the various fish species there – though how he knew this is unclear, whether it was true then is uncertain, and whether this is still true certainly can be doubted. Their numbers in the lakes have also probably plummeted.

According to James Cowan “…introduction of the pakeha’s trout to the lakes resulted in the depletion of these supplies” and he concluded that when Māori took a case to the Native Lands Court and the Supreme Court “the outcome was the vindication of the Māori cause”, though just what was achieved is not stated. Cowan related a story in which a Māori chief demanded whitebait, which “swarmed in all those lakes (around Rotorua) before the pakeha trout were introduced”. And, as elsewhere, the kōaro in Lake Rotoaira were later described as “now almost eaten out by trout liberated within recent years”.

Dominion Museum naturalist William Phillipps had repeated involvement with the lakes and their fish populations. In 1921, he recognised that “the larval form (of the kōaro) is utilised for food in the spring and early summer months by the natives in the Thermal District, North Island”, and when he later examined the stomach contents of trout collected from many of the Rotorua-Taupo lakes in 1921, he not unexpectedly found that the huge shoals of juvenile kōaro in Lake Taupo were the major food resource for generating such trout growth. However, though he thought that “there can be no doubt that decreasing food supply has a direct bearing on the question (of the condition of the trout) in the thermal lakes”, he was “of the opinion that this is not the solution to the whole problem”. He later (1940) described how he had in 1919 seen platforms erected to dry (kōaro) in thousands, whereas in 1927 no evidence of Māori fishing for this species was to be seen. All this, he considered was “apparently due to the introduction of trout some years previously”.

There must therefore have been deep irony for Māori, in Phillipps’ description of Māori harvesting of kōaro as “continuous destruction of trout food by the Māori”, even though Māori had exploited kōaro from the lake for centuries – though not for much longer. The possibility of a closed season for whitebait in the lake was raised in order to prevent undue harvest and to conserve the food supply (for trout!), though Phillipps did realise that Māori had a statutory right to take kōaro from the lake, and he saw this as a “difficulty”. Phillipps would also later recognise similarly adverse impacts of trout on kōaro populations in Lake Waikaremoana, where: “this was an important food fish but as the trout have increased, the maehe (a local Māori name for kōaro) have become less common”. Trout in the lake led to exclusion of Māori fishers harvesting fish there, too, not so much by statute, as by the decline in the native fish stocks there.

Looking back at all this from more than half a century later, the kōaro populations have essentially disappeared and their role in the lake has been largely usurped by smelt that were liberated there to provide a replacement food for the trout. There is a view that the smelt populations have further depressed the kōaro stocks in the lakes, perhaps by the adult smelt preying upon the larval kōaro. In the meantime, the trout stocks have substantially recovered, in part because of the availability of smelt as prey, and in part because harvesting trout from the lake by anglers keeps the trout populations under more control. The days of over-population by trout in the lake are a thing of the past.

But, getting back to my beginning question: Have trout worn out their welcome? It is, I suppose, a matter of opinion. It is sometimes said that what you see depends on where you are looking from!
4.11 Did I say that?

_Fish and Game_ 61, 2008

R M McDowall answers critics of his Issue 59 story, _A Matter of Opinion_, in which he posed the question: Have trout worn out their welcome in New Zealand?

Responses to my article in Issue 59 (_A Matter Of Opinion_) sure were interesting, but not dissimilar to what I expected. Note the first sentence of that article: “I imagine that anglers reading this article will react with either disbelief or outrage!” I guess there was plenty of both and I offer no apology for the article. All I did, really, was tell some history and what readers have done is reveal their personal responses to that history. It wasn't me who made anyone feel guilty. If the cap fits, then wear it, I say.

One of the issues that confronts the interface between recreation anglers and hunters on the one hand, and those who are interested in the conservation and management of native fauna and flora (animals and plants) on the other hand, is the question of biodiversity and I am in no uncertainty that biodiversity matters – if for no other reason than that we have international obligations to care for indigenous biodiversity under the Rio Convention on Biodiversity protocols. We see these kinds of conflict a lot, as in relation to whether tahr and chamois are an asset (to hunters), or a menace (to botanists interested in alpine flora). You'd think, some say, that the fact that we have populations of these exotic animals that are endangered within their native range, provides a unique opportunity to offer hunting of them not only for New Zealanders, but also for international clientele. And they do, but at what cost to the plants that live up at the limits of life along the Southern Alps? Some people care about that, others seemingly don't. There is no comprehensive, single, uniform answer to this question and, in the end, we have to manage these ‘resources’ to meet the interests of a very disparate diversity of interests and people. The same applies to our introduced, exotic, alien trout populations, except that New Zealand is very much not just the only place where these species can be caught, as epitomised by the Issue 60 feature (It Happens When It Happens) by editor Bob South, who went fishing for brown trout on Tierra Del Fuego. I've encountered much the same on the Falklands (see Issue 30). Again, there is no single answer and we have to manage their populations with much the same tension between exotic and native, abundant and endangered, troublesome or harmless. It's a question of balance.

As I said, the response to my article (_A Matter Of Opinion_) didn't surprise me. In fact, since it was published a few months ago I've had odd people ask whether I've had any personal response and they clearly thought I might have bought into a debate of some robustness. I suppose the somewhat ‘siege mentality’ in some of the half dozen responses in the Letters pages in Issue 60 did surprise me a wee bit, though remembering back further, the article _Stop Slagging The Shag_ (Issue 38) did evoke some ‘interesting’ response and I wasn't all that surprised about that either. Got a few people thinking, didn't it, and that's what it is all about? I totted up and found that I've written about 50 pieces for Fish & Game New Zealand over the years on a very wide range of topics, and that breadth has been really deliberate, though I suppose I have just written about themes that happen to be coursing through my mind at the time, often provoked by something someone said, or that I had read, or which others have suggested might make interesting reading. About a third of them have related explicitly to angling, the others being about people, about conservation issues, or about native fish.

So, given the number explicitly about angling, often based on my own angling experiences, I'm not really surprised at the level of intensity objecting to my challenging the sacred shibboleth of the sanctity of trout fishing, and my asking some questions that I hope might stimulate a little lateral thinking by some of the practitioners. I suppose it’s quite a long time since I wrote articles such as _The Year Of The Frog_ (Issue 17), _Memories Of An Antediluvian Tongariro Fisherman_ (Issue 25), _Taupo Rips Of The 50s Live On_ (Issue 29), that are about angling around Taupo and lots of others. The response to _A Matter Of Opinion_ seems to have engendered such deeply felt responses that memories of these other articles will probably have disappeared into the cranial sludge – a kind of shock response! I'm not going to make any apology. In fact, the response only confirms, for me, the importance of writing pieces like these in a
hope that at least some people might see some balance in what we are dealing with. But six letters in response to that piece! Wow: got the chains rattling didn’t I, but much as I predicted? Ho hum.

I’d like to pick up some of the comments – not to argue that my opinion is better than anyone else’s, but to restore some balance. For starters, some of the outraged comments are rather tangential to the article. People seem adamant, for example, that trout are ‘here to stay’. I don’t disagree. Wherever did people get the idea that I think we should eliminate them? That’s just ‘bunker mentality’. We are stuck with them, whether we like it or not, and clearly some people like it more than others. For me, I deeply regret some of the adverse impacts of trout. In particular, it seems to me that they don’t have to be everywhere, as some anglers seem to think they do. Interestingly, the National Fish & Game Council agrees, and has stated that it is willing to look at trout removal in situations where they are of no value to angling and are having adverse impacts on significant native fish populations. Moreover, it has happened, here and there. Shocking, eh?

But that aside, I suppose one of the things that does surprise me is the level of angler anarchy out there – the level of fanaticism that seems to permeate even among some levels of officialdom. I quite often allude to the Wildlife Service liberating trout into Lake Oberon in Fiordland National Park. That is anarchy from within the corridors of bureaucracy and is simply unacceptable to me (you may not care that it is, but that’s another matter). I heard the other day that staff, I think by the time it was happening, of the Department of Conservation, if they happened to be heading into some backcountry catchment, would take a bucket of brook char with them and chuck them into streams, and I suspect that much the same accusation could once have been made of the Otago Acclimatisation Society. You’ll find these damned fish all over Central Otago. We found some the other day in a tributary of the Nevis and they are actually quite widespread there. They are absolutely useless from an angling perspective, reaching the princely size of about six inches and yet have the potential to cause ecological chaos among the galaxiid populations that live in these streams. Some of you may not care, but then some of you may not care about drunk drivers, either. But I do, in both cases. They are a scourge upon society and both are illegal!

A fellow phoned me a few years ago, wanting to talk about whitebaiting on the Clarence, but, as things do, we got rambling and he began to talk about Lake Macrae in the Kaikoura Mountains nearby. Some years ago, some anarchist liberated brown trout there and they grew like mad (actually, probably like in the beginning when small lakes like that were full of kōaro whitebait – as I wrote in A Matter Of Opinion), and people who were able to get there were catching double figure fish. But they can’t spawn there, and so eventually died out. Anyhow, this fellow said he was going to liberate some rainbows there, to which I hotly responded: “Don’t you bloody dare!” And somehow our phone call rather tailed off and I could get back to some work. Doing so without authority is illegal, just like drunk driving is illegal. The lake is virtually inaccessible, except by chopper and so would be of minimal value to all but a select few. It is one of the few surviving lake populations of kōaro not seriously stuffed by trout introductions. Who cares? Well, I do, for a start, and that may not count for much, but still, I do. I suppose what really disturbs me is the extent to which some people will pursue their own, petty, private interests with total disregard for others, whether it be drunk driving, or illegal liberations of fish. I guess making a comparison with drunk driving is a bit tough, but it emphasises my point.

I happen to take some offence at Alan Bradshaw’s comment in the Letters To The Editor pages that anglers’ “work has done more than anyone else, including McDowall, to protect the habitat of native fish”. Excuse me, but that is simply B ... S ... ! What does he know? Precious little as far as I can tell. For Bradshaw’s information, for well over a decade I sacrificed my research career to manage a group of fisheries scientists whose task it was to assemble the information needed to lodge conservation orders and/or protect instream values for rivers and lakes all over New Zealand, and they worked their butts off to argue for habitat protection. Bradshaw clearly knows absolutely nothing about how rivers like the Rakaia were saved from being wrecked by ill-considered irrigation abstractions, about proposals for dam construction on other rivers, and a plethora of other adverse impacts. I remember one day complaining to the deputy Director-General of MAF that our little group was being beaten up by the Ministry of Works with its huge deployment of dollars, engineers and bulldozer drivers, to which he responded,
with searing wisdom: “Stop complaining and get out there and show them how good you are.” And we did. We defer to no one as to our advocacy for New Zealand’s rivers and lakes, get that: NO ONE! It was, very generally, the information we collected and published that made it possible for some protection of rivers and lakes all over the country, and on my shelves is more than a metre length of reports that derive from that research and form the basis for understanding the fisheries impacts of these important waterways, even today, a decade or more later. The national angling survey was conceived, managed, and written up by this small group of staff and has made a major contribution to habitat protection.

Let me turn to the curious comments of another letter writer. In a way, they tell us more about him than about anything else. Bill Albert professes to be “offended” at my “inference that Māori should have been consulted about the introduction of trout in the 19th century”. Did I say that? I couldn’t find where I did. I said they were unhappy about that and thought they should have been. I related the experience of Māori and cited some of the things they said. However, in a way that’s being a bit picky, and let me admit here, even if not in my original article, I do think that Māori had a right to be consulted! Back in the middle of the 19th century, substantial populations of Māori lived around the big central North Island lakes in a way that they did not do anywhere else in the country, except perhaps up the Waikato River. I accept Gil Brandeis’s comment that they also lived on kereru and other birds, even moas, as Keith Ramsvelt argues, but I think that it was the sheer abundance of the kōaro-whitebait populations, as well as koura and kakahi in the lakes, that made Māori life around these inland lakes possible.

Let me ask another question: Whose lakes were they? I know this is a very touchy question for many, but there is general agreement that before colonisation they belonged to the Māori communities that lived around them. How did this ownership change after signing of the Treaty (if I may use another word that seems to provoke outrage). Or, in fact: Did ownership change? The courts of our land now agree that Māori owned them then and that they probably still do. I’ve done a lot of reading around the early history of Māori freshwater fisheries and am at present struggling to complete a large book on the topic. So: Who does own the lakes?

There was much debate about this question in the early 1900s. If these various letter writers were to read a little history, they would find the governments of the late 1800s and early 1900s getting rather agitated about these lakes, partly because they could see their tourist potential. In the early 1900s, there is literature that discusses the ownership question and it writes of the government seriously considering testing the question of ownership in the courts of the day. Hopefully, it was agreed, that might clarify it all. Then, all of a sudden, that discussion ceases. Why? Well, as I see it, the government of the day was advised by the then Solicitor General that it was unlikely that they would win a court case, but rather that the courts would rule that the lakes were still owned by the Māori s who lived around the lakes, as they had before the Treaty (ugh, that awful word again) was signed.

Shocking, isn’t it? You see, it was on that basis that the government changed its strategy and decided to negotiate some kind of agreement over the lake ownership question, rather than go to court about it – better to outflank the Māori s, rather than to lose to them in court. This happened with the Rotorua Lakes (except that Māori were unwilling to cede any kind of ownership on Lake Tikitapu), it happened with Taupo, and also with Waikaremoana. And, much more recently, when the Tongariro Power Development was taking place, it happened again with Rotoaira. And a little reading will show that the courts have ruled that the Māori also owned Lake Wairarapa, most recently Lake Ellesmere, and even the Whanganui River and the Waikato, and these aren’t all modern-day rulings in which some people think the government has become ‘soft in the head’ as a result of the claims under the Treaty (ugh, again).

Most of these events go back to the early 1900s. You see, we’re being living in Cinderella-land thinking that ‘the people’ own the lakes and the rivers. The only reason why ‘the people’ own rivers dates back to a 1903 amendment to the Coal Mines Act (for goodness sake) in which a clause was added stating that the government owns all of New Zealand’s navigable rivers. So, it is all rather less simple than we tend to think. Should, then, Māori have been consulted over the release of trout into ‘their’ lakes? I rather suspect that they should have been.
In a way, the saddest thing about this whole question is that the Māori people have, in my view (and you may disagree with me, and that's your privilege), really been rather generous in the extent to which they have shared 'their' lakes. Takes a bit of getting your head around, doesn't it, especially if you have been unaware of all this history? So, when agreements have been signed between Māori and the Crown over the ownership of various lakes, at least in the view of this simple fellow (i.e. me!), I think the Māori people have been generous to a level that we need to recognise. I think Gil Brandeis is a little unfair to Tuwharetoa saying that vesting Lake Taupo in the ownership of Tuwharetoa will "no doubt result in ongoing problems". Let's watch them "like a hawk" and see what does happen. They have vowed that this won't affect public access to the lake. I will want them to stick to their word, and I think they will! I'll buy Bob South a bottle of whiskey if I'm wrong.

And, finally, when someone accuses me of not mentioning that the government pays Tuwharetoa the equivalent of half of the licence revenue from the Taupo fishery, it really seems to me that this is a question for that someone to discuss with Tuwharetoa. And it is for Tuwharetoa Māori to decide whether this is fair compensation for the loss of the native fisheries in the lake, and for allowing us all to share the use of a wonderful asset.

Let me close by giving the pot another stir. I've been thinking for a while that it would be a really interesting experiment for the spawning streams that support the trout fishery in Lake Rotoaira to be fenced across so that the trout couldn't spawn. I wouldn't agree that it should be done in Taupo, but I'd really, genuinely, be interested to see what might happen in Rotoaira. In a few years, the trout populations would dwindle and eventually disappear. I'd just love to see what would happen to the kōaro populations in the lake. You see, it's a low risk experiment, as it would be easily reversible in a few years. In the meantime, we could get some sense of what the famed Māori kōaro fishery in Lake Rotoaira was once like, or perhaps just a bit of an idea. Water quality might have deteriorated and also the increased flow through of water as a result of the power scheme might have made a difference. But, it'd be an interesting experiment, don't you think? In the end, that's a question for Tuwharetoa to decide. You see, they own the lake.
5 The giant of freshwater fisheries – Bob McDowall

Fish and Game 72, 2011

Don Jellyman profiles the life and work of R M (Bob) McDowall, New Zealand’s most brilliant and respected authority on freshwater fish. McDowall, who died suddenly in February, always had “a passion for discovering and disseminating knowledge and popularising science” and an uncanny “ability and willingness to communicate his science to lay audiences”.

Over the years, R M (Bob) McDowall was a frequent contributor to Fish & Game New Zealand magazine. Bob, a fishery scientist and arguably New Zealand's foremost authority on freshwater fish, contributed a rich and diverse series of 48 articles on topics ranging from the names of trout, biographies of prominent fisheries managers and researchers, the perils of the cumulative loss of waterways, reflections on the Taupo trout fishery, whitebait, and many others.

Often Bob's articles were provocative and resulted in a flurry of correspondence. He rather enjoyed this, as an overriding goal in his writings was to challenge commonly held opinions and provoke people to think through issues from a position of being well-informed. So who was Bob McDowall and from where did his knowledge and motivation come?

Bob was born in Palmerston North, the second youngest in a family of five. Both parents were influential in his later choice of a career in science – his mother completed an M.Sc. in zoology in the 1930s, a very unusual feat for a woman at that time. She got off to a bad start when her professor advised that her proposal to look at the intestinal parasites of pigs was not a suitable topic for a young woman, so she changed to entomology (the study of insects). Bob's father was a gifted student and gained a B.Sc. at Otago at a young age. He trained as an organic chemist and was awarded a scholarship to study at the University of London, where he completed an M.Sc. and a D.Sc. three years later. On return to New Zealand, he was employed by the Dairy Research Institute and was later elected a fellow of the Royal Society of New Zealand. His manual on butter-making was the New Zealand standard for many years. Bob's father taught his son the skills of scientific writing and acted as a critic for Bob's early writing.

As a deliberate ploy to provide a diversion to her husband's devotion to his work, Bob's mother took up flyfishing and taught both her husband and their children. Thus commenced a long association with trout fishing for Bob that started with the small streams and rivers of the Manawatu and graduated to the legendary Tongariro River. Although the family did not own property at Taupo, they always camped at Mission Point and Bob warmly recalled days of fishing and nights around a campfire. Trout were plentiful and three members of the family once caught 77 over a three day period. Such fishing trips were instrumental in forming Bob's association with freshwater fish. From his parents, Bob inherited a love of the outdoors and an appreciation for language and art.

Following academic success at Palmerston North Boys High, Bob studied at Victoria University of Wellington from 1958 to 1962. By his own admission, he was fortunate to be admitted to the graduate programme, as he only received a C pass in zoology in his third year. However, his mentors recognised his potential and he commenced an M.Sc. on the ecology of the redfin bully. This study involved many hours spent in the field, especially the Makara Stream west of Wellington where Bob was able to observe bullies spawning at first hand. He vividly recalled the excitement of this discovery. He joined the Fisheries Division of the Marine Department in 1963 and commenced research on inanga, the main species of the whitebait fishery, in the Waikanae River. In those days, there was a dearth of information on all freshwater fish and, as Bob commented in a book on whitebait (The New Zealand Whitebait Book, McDowall, 1984), most research was based on the premise “that if we go and study everything, then something interesting might emerge”. This lack of information extended to identifying the various species of native freshwater fish. This was very much an open field, as the only significant contribution was from Gerald Stokell, an amateur biologist, who was by profession an orchid grower (McDowall profiled Stokell in Issue 39 of Fish & Game New Zealand, A Man With An Eye For A Species).
fisheries research at this time was poorly financed and facilities were very limited – the main laboratory was the old Wellington City morgue. The power supply was so inadequate that, if more than two radiators were put on at the same time, the fuses blew.

Partly because of the lack of funding, but also endless head office memos that interfered with research activities, Bob actively pursued further study opportunities. During this period, he wrote a short paper on the origins and derivation of the New Zealand freshwater fish fauna and suspected that this was one of the main reasons he was offered a scholarship to Harvard University in America. In his own words (The New Zealand Whitebait Book, McDowall 1984): "By that time I was well on my way, armed with my entry permit to the United States and Harvard, a good scholarship, an extensive fish collection, and a wife of only 10 days. We sailed on the Whangaroa – a small cargo ship carrying just five passengers – for a three week honeymoon across a heaving Pacific to our eventual destination in Boston." There, Bob began his lifelong association with the taxonomy of Galaxiids – that group of southern temperate fishes that includes whitebait and mudfish, which have diversified into a wide range of species in New Zealand, Australia, South Africa, and South America. The time at Harvard proved extremely stimulating, as he mixed with some intellectual heavyweights, such as P. J. Darlington, regarded as the father of zoogeography, and Ernst Meyer, a pillar of evolutionary theory and a prodigious author; as well as Gaylord Simpson, Alfred Romer, and other legendaries of that era. Meyer had a reputation as an austere and critical professor, but there was a lighter side to his character, as Bob discovered when meeting Meyer while carrying two large bottles of distilled water. Meyer dryly muttered: "I hope that isn't alcohol for a student party."

During this time, there was considerable government pressure in New Zealand to introduce the North American largemouth bass as a new game fish to northern New Zealand. Bob became embroiled in this debate and was asked to provide a review of the likely impacts of this very predatory species on our native fish fauna. He concluded that bass had the potential to decimate some of our native fish stocks and, fortunately, good science prevailed over political desire and the application was rejected.

Coming back to New Zealand, Bob was instructed to work on the diet of trout, an unfortunate departure from his beloved native fish. Rather than provoke a storm, he quietly carried on investigating the ecology of the whitebait species, sorting out the taxonomy of the remaining freshwater fish. Duncan Waugh, the research director, eventually agreed that research on whitebait was also needed and thus started in 1969 an annual pilgrimage to South Westland, where Bob and helpers undertook an extensive programme researching the ecology of whitebait migrations. Upon seeing the convoy of vehicles and boats departing from the Wellington Laboratory, Waugh commented: "It looks like you have everything except the kitchen sink." In fact, they did have a kitchen sink – an essential commodity for the three months each year (1969-73) that the field programme ran. As Bob frequently observed, it would be impossible to undertake such a venture under today’s science funding system.

The mid-1970s saw a change in responsibilities for Bob when he was asked to take control of the expanding Christchurch freshwater laboratory. Just prior to his departure for Christchurch in early 1978, his first book on freshwater fish was published – the first comprehensive account of the biology and ecology of native and introduced freshwater fish of New Zealand. With the retirement of Max Burnet, the Assistant Director (Freshwater) in 1983, Bob was appointed to the position. The management of more than 60 staff took a considerable toll on his time and energy for research. Being largely desk-bound, he used the little available time to further his interest in zoogeography and dispersal theories of native fish. His contribution to such fields was acknowledged when he was elected a Fellow of the Royal Society of New Zealand in 1984.

Being direct and forthright by nature, Bob often got offside with bureaucrats, ‘bean-counters’, and politicians. However, he chose his battles and learned to work within the system. For example, the Christchurch campus of the late 1970s was a series of old buildings and the need for extended and more up-to-date facilities was essential. Bob lobbied extensively for new buildings and was eventually successful. His many years in senior management taught him to act quickly before someone in head
office changed their mind. A contractor was rapidly engaged and instructed to commence pouring concrete as soon as possible. This action was none too soon, as within a few days, an instruction arrived from head office to put the buildings on hold, but, of course, it was (regrettably) too late and the buildings went ahead.

In 1985, Bob received an invite to be a keynote speaker at the first international conference on diadromy, the movements of fish between fresh and saltwater environments (Boston, March 1986). The reading and research he did while preparing his talk lead him to write the first-ever book on diadromy. Naturally, this also included the ecology of invasions by new species and species interactions and Bob published a number of keynote papers highlighting the vulnerability of fish faunas like New Zealand’s – here the native species have grown up in an environment free of specialised predators and hence they are very vulnerable to predation by trout. His article on the loss of grayling in New Zealand (Issue 22, Fish & Game New Zealand, A Fish Lost And Gone Forever) highlighted such problems.

The 1980s brought with them directives from the government to investigate community irrigation schemes and the development of small and large scale hydro. Bob and the freshwater research teams in Christchurch and Wellington became very actively involved in investigating the impacts of hydro schemes on such rivers as the upper and lower Clutha, upper and lower Waitaki, Hurunui, upper Wairau, Rangitikei, plus the Canterbury Central Plains Irrigation Scheme. A number of these schemes have gone ahead and have changed the face of agriculture and river ecosystems throughout New Zealand. Bob sensitively wrote about the importance of wild rivers and angling opportunities in such articles as How Much Is A River Worth? (Issue 45, Fish & Game New Zealand) and Our Legacy Is At Risk (Issue 47, Fish & Game New Zealand). With regard to the cumulative loss of freshwater habitats, he coined the phrase “the little bit more of the little bit left”, which was subsequently adopted by other environmental writers.

In the 1980s, responsibility for freshwater fisheries was with the Ministry of Agriculture and Fisheries and, as member of that department, Bob attended the North and South Island Council meetings of the Acclimatisation Society (the pre-cursor to Fish & Game Councils). Bryce Johnson was the newly appointed society director and recalls that Bob possessed a “reliable and forthright ability to tell some of the acclimatisation society ‘grand standers’ at the time, when they were sounding off about the assumed state of a fishery and the need to ‘release more fish’, that they were talking ecological nonsense’. Says Johnson: “As the new kid on the block, albeit with an understanding of the ecological principles he was espousing but a mere staff member, I found his direct approach most helpful, as he did not hesitate to say things that would have probably had me down the road had they come from me.”

In 1984, there was yet another bid by government (Department of Internal Affairs) to take over the acclimatisation societies. Bob was a stalwart defender of the autonomy of the fish and game movement and became embroiled in the battle. Murray Williams, a university contemporary and respected wildlife scientist, was asked to attend some of these meetings to act as a foil to Bob’s vocal opposition. Williams recalls: “Bob was a regular FRD (Fisheries Research Division) representative at North and South Island Acclimatisation Society Council meetings in the late 70s and early 80s, where his tall stature, booming voice, and sheer force of personality used to leave the Wildlife representatives floundering and always playing political catch-up. Early in Ralph Adam’s tenure, there were moves from within the central North Island wildlife conservancy for a full-blown takeover of the society movement, in large measure an attempt to remove FRD from its role as an advisor on fisheries matters to societies and stop them being an irritant about Wildlife’s continued role in fisheries management in Rotorua-Taupo and the Southern Lakes. The words ‘that bloody McDowall’ could be heard through the paper-thin walls of the Bowen State Building, as the conspirators planned in the office that just happened to be next to that of me and Tom Caithness. At one stage, I was asked to come along with the Wildlife Director as a scientific counterfoil to Bob…I attended three such meetings, saying nought at each, before I was told that I was ‘too cozy with your scientist buddy McDowall to be of any damn use’. The plotting continued, but to no
avail because Internal Affairs Minister Peter Tapsell’s grand plan went nowhere… and just a few years later the big environmental shake-up was unveiled, DoC was formed, the CRIs were launched, the acclimatisation societies given their ‘heads’ as Fish and Game Councils, and life pretty much returned to normal.”

Bob was not always the easiest boss to get on with and could be a stern critic, but he taught us group of junior scientists the importance of asking the right questions. His arguments were persuasive and his logic almost invariably correct. He always read widely and had a prodigious written output, which includes 12 books, 267 scientific papers, and 232 popular articles. The rapidity of his output was daunting. I once wrote a paper on a new species of eel that we had just discovered in New Zealand, but Bob told me I had missed the main event, which was, of course, the biogeographic significance of a new species turning up in New Zealand. I challenged him that this was a paper that only he could write, but he claimed he was too busy, yet three days later, a completed manuscript, written mainly during the evenings, arrived on my desk. Murray Williams had a similar experience when he approached Bob to write a book on trout in the Fish and Fowl series, a series of books about gamebirds and sports fish intended to inform bird hunters and freshwater fishers about the animals they chased. Having produced two books on gamebirds, and a Taupo fishing guidebook, Williams wanted “a straight-forward book on trout biology for fishermen as the fourth book”. Says Williams: “I chatted with Bob about it … and six weeks later he mailed me this script, together with line drawings of each salmonid. I published this as Trout in New Zealand Waters and the content was exactly as Bob had delivered it. I couldn’t believe that someone could knock off a draft so quickly and have it in such fine grammatical shape as to need no editing at all, and I fancy Bob wrote it off the top of his head.” It was a wonderful piece of science communication directed exactly at the level his intended audience wanted … and looking back I see his ability and willingness to communicate his science to lay audiences as one of his really great achievements.”

After steering freshwater fisheries research for 13 years, Bob stood down in February 1991, which enabled him to return fulltime to research on fish. When NIWA was formed in the same year, Bob was asked to manage the freshwater fisheries group, but soon stepped down, figuring he’d done his share of administration over the years. His research interests took another turn at this time, as he focused on the distribution and biogeography of New Zealand freshwater fish – a series of papers on these topics followed. Before ‘retiring’ in March 2000, Bob successfully applied for a James Cook Fellowship that gave him two years to pursue research of his choice. An undoubted highlight of these two years was his visit to the Falkland Islands to study the freshwater fish community (see Fish Of The Falklands, Issue 30, Fish & Game New Zealand). Although his planning was meticulous and Bob and his two companions arrived on schedule, most of their equipment did not. He managed to persuade the local electricity authority to manufacture a makeshift electric-fishing electrode and the visit was a success. Another book followed.

Bob had a passion for discovering and disseminating knowledge and popularising science. For him, it was a privilege exploring biology and understanding relationships. He said before his death that he has been very fortunate in having a number of “ah ha!” moments (his words) when he had made an important discovery and had the immense satisfaction of seeing bits of a biological jigsaw come together. The incident mentioned earlier of seeing a redfin bully spawn in the Makara Stream in 1961 was such an occasion and one that helped cement his desire to unravel the taxonomy and life-histories of native fish. You didn’t have to engage Bob long in conversation on native fish to realise the enthusiasm was still there until he passed away.

He always cherished works of art and a soon to be published book, Ikawai. Freshwater fishes in Māori culture and economy, which is a compilation of historic and contemporary Māori customary fisheries (872 pages), is lavishly illustrated with ancient and contemporary Māori art featuring freshwater fish and fishing. The flier says: “Bob has amassed an extraordinary collection of photographs of the fish themselves, of the artefacts Māori customarily used in catching fish, and of artworks by modern Māori practitioners, some reflecting the many legends and stories associated with fish. He has also unearthed
some stunning and highly significant historical images that were hidden away in archives, libraries, and photographic collections." This book has been many years in the gestation and its publication is keenly anticipated by his wife Ainslie and by many in the scientific and Māori communities.

As he always had a huge interest and concern about conservation, Bob sought other avenues of service and was appointed to the New Zealand Conservation Authority (NZCA) in 2008. The chairman, Don Ross says: "Bob completed two and a half years of his three year term on the New Zealand Conservation Authority before his deteriorating health led to his resignation. He was appointed to the NZCA on the recommendation of the Royal Society of New Zealand. During this time, he has been the liaison person with the Nelson/Marlborough Conservation Board and played a significant and constructive role in the approval of the Kahurangi National Park Management Plan. His experience in freshwater and fisheries management, forthright manner, and broad knowledge of conservation matters will be a huge loss to the NZCA. During October, the NZCA met on the Chatham Islands and it wasn’t long before Bob had his net out and was helping locals with identification of various fish species…they were fascinated with his knowledge."

During his distinguished career, Bob received many awards and accolades, including being made a member of the Royal Society of New Zealand (1984), an honorary life member of the New Zealand Freshwater Sciences Society (2000), and he was a guest speaker at a number of international conferences. He was seconded to work at other institutes in South Africa, Australia, and the United States. He served as co-editor on a number of scientific journals and refereed an impressive number of papers. Over his last two years, he refereed papers from more than 50 different scientific journals.

In his final days, as he reminisced over such a distinguished career, Bob remained grateful for the opportunities that came his way, acknowledging both the contribution that his parents made to his values and interests, and that he was the right person in the right place at the right time. As he commented to me once, his intellect was both his greatest asset, but also a liability, as it provided a never-ending source of ideas, which he then felt compelled to pursue. Readers of Fish & Game New Zealand have been the recipients of many of these ideas and articles, as Bob took the time to recast scientific writings in a digestible and practical form.

Māori have saying that a giant totara has fallen in the forest of Tane, but it’s falling makes space for a new tree to flourish. Bob was that forest giant in freshwater fisheries, and his legacy is the many students and researchers who are able to build upon his scientific discoveries and writings. Both the scientific and angling communities acknowledge his vast knowledge and unique ability to communicate through both the spoken and written word. A communicator extraordinaire indeed.
enhancing the benefits of New Zealand’s natural resources