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NEW ZEALAND
Freshwater Sciences Society

NEWSLETTER



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MAIN COVER PHOTO:

One of the NIWA photo competition entries. Ryder Falls.

Photo © @shannon_crow

COVER LOWER PHOTOS:

LEFT: DOC Freshwater Technical Advisors doing a fish survey in the Ararira catchment as part of Living Water programme.

See article on page 24. Photo © Living Water

2nd FROM LEFT: Projects manager Sophie Allen and intern Emma MacKenzie monitoring Canterbury mudfish at Tuahitara Coastal Park, North Canterbury.

See article on page 58. Photo © Greg Byrnes

2nd FROM RIGHT: Kirsty Brennan from EOS Ecology working with local iwi and schools monitoring temporary spawning habitat. See article on page 9. Photo © EOS Ecology / Bronwyn Gay

RIGHT: Critter of the Year.

See article on page 13. Photo © P. Ryan

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One of the NIWA photo competition entries.

Photo © @shannon_crow

INTRODUCTION TO THE SOCIETY



The New Zealand Limnological Society was formed at a meeting in Christchurch in January 1968. It was renamed the New Zealand Freshwater Sciences Society (NZFSS) in 2005 to reflect the broad interests of the membership. Its fundamental aims since inception have been to promote a common meeting ground for freshwater workers in New Zealand and to encourage and promote the exchange of news and views among them. In particular, a newsletter and a list of research workers and their interests is compiled and circulated at least once a year and an annual conference is held. The 2016 subscription is \$55.00 per annum; or \$15 for students, the unwaged, or retired persons. Committee members for the 2015–2016 period were:

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1. Note that the advocacy and submissions position is now vacant—please let the committee know if you would be interested in taking up this role.

EDITORIAL



I recently visited my family who live in a small rural town south of Christchurch. They have a small creek that runs through their section which I absolutely love. I love it

because this creek used to be home to a handful of eels, some quite large, which we fed our dinner left-overs in the dark. We were astounded how the eels made their way upstream, following the smell of the food and gently, yet determinedly grabbed the chicken leg which they then gulped down. I also love it because it showed me some of our taonga New Zealand has to offer, right here in our backyard.

Well, this creek has been dry throughout most of last autumn and winter, and the amount of water it carries now is pathetic and certainly doesn't present suitable eel habitat. Lack of flow caused nuisance macrophyte growth which caused siltation and you all know how the story continues...

The take-home messages to me are:

- 1) my children won't have the opportunity to meet our taonga in their backyard, and
- 2) my children won't meet the creek.

On a more positive note, however, awareness about the decline of water quality has (finally) risen amongst New Zealanders and the Society has been proactive and helped to communicate this fact. I guess it takes a long time for it to really sink in that the state of our rivers and lakes is so poor that more than half of New Zealand's waterways are not swimmable anymore. As a scientist, I knew this first hand, but I thought this is not going to happen so fast and not to 'my' creek. It now has and it will take a long time to fix it.

Now, it is absolutely critical – more than ever – that we continue to outreach and inform the public how to stop this decline and how to turn things around. It's the hope that my kids can meet 'Mr and Mrs Eel' one day that keeps me going.

Communication of science between and among scientists and the public has changed since I started editing this newsletter four years ago. We are doing a much better job in getting our messages out there as you can read in this newsletter. Let's keep up this momentum and use all available channels we have to make a difference. So tweet, post, blog, post messages and communicate, and put our society's work and New Zealand's freshwaters in the spotlight! A great article that pretty much sums up my thoughts is this one: www.thespinoff.co.nz/society/04-11-2016/science-experts-waikato-jacqueline-rowarth.

Talking about differences: we made some changes to the way this newsletter is presented: we tried to shorten it and spice things up a bit. I hope it works for you.

Finally, it's time for me to hand over my editorial role to the wonderful Natasha Petrove who has been a fantastic assistant over the last years and who, together with the strong support from EOS Ecology, is very capable of editing this piece of very important work done by a bunch of wonderful people.

Thank you for the opportunity to work with you all and fight the good fight!

Enjoy the read!

Ngā mihi nui

Kati Doehring
OUTGOING NEWSLETTER EDITOR ■

PRESIDENT'S PIECE



Freshwater quality and freshwater ecosystem health continue to be among New Zealanders' greatest concerns as many Kiwis feel that a clean environment and clean freshwaters seem to be slipping away. Freshwater scientists and the NZFSS have a key role

to play in the environmental discourses of the present time in that we provide the scientific information on which to assess historical freshwater trends, current condition and future freshwater management.

This year has seen many developments in the freshwater space including:

- the introduction of the Government's Next Steps for Freshwater discussion document,
- a rising awareness about the nuisance 'lake snot' (a slimy exudate produced by a planktonic diatom invading oligotrophic South Island lakes),
- the publication of Aotearoa 2015 (MfE's 5-yearly assessment of the state and trends of NZ freshwaters),
- the extension of the Land and Water Forum's mandate into a 3rd phase until 2017, and
- increasing ties and collaborations between NZ and Chinese freshwater scientists including the setting up of the NZ-China Water Research Centre at Lincoln University.

So it's been an interesting and exciting year and freshwater issues and science have been covered extensively by the various NZ media. It's great to see many of our members promoting these issues into the public arena.

NZFSS ACTIVITIES IN THE PAST YEAR

Below is a list of some of the activities that the NZFSS Exec has carried out on behalf of the Society:

- Submission on the Ministry for the Environment's Next Steps for Freshwater discussion document.
- Submission on the Environmental Institute of Australia and New Zealand's Ecological Impact Assessment (EcIA): EIANZ guidelines for use in New Zealand: Terrestrial and Freshwater Ecosystems.
- Provision of letters of support to the Australian Society for Limnology to host the International Society for Limnology (SIL) conference in 2020 in Brisbane and the American Society for Limnology and Oceanography (ASLO) conference in 2021 also in Brisbane.
- Letter to RadioNZ's Paul Thompson (CEO) and Glen Scanlon (Head of Digital) expressing the NZFSS's concern over the restructuring of the programme Our Changing World and other science programming.
- Attendance as an observer party at the Land and Water Forum meeting in February.
- Participation in the annual Royal Society of New Zealand Constituent Society Meeting (thanks to Graham Sevicke-Jones for attending for us).
- Presentation at the Freshwater Management and Infrastructure Forum in Wellington on 'Optimising the role of freshwater science and scientists in the development of freshwater resources'.

Those interested in reading our submissions can access them at on the NZFSS website (www.freshwater.science.org.nz/index.php/bulletin-board/#submissions).

INDEPENDENT REVIEW OF NOF PROCESSES & GUIDELINES

Some members may be wondering about the independent review of the NOF (National Objectives Framework) process and guidelines that was discussed at the last AGM. We considered undertaking such a review but eventually decided that we would drop the project because: 1) MfE is progressing apace with the development of new NOF attributes and guidelines, and 2) lessons had been learnt about the initial process of engagement with freshwater scientists, which left some of our members frustrated and disappointed.

MEMBERSHIP ON THE LAND & WATER FORUM (LAWF)

This year NZFSS was invited to become a member of the Land and Water Forum, which I feel is a nice demonstration of the value and esteem that our Society engenders. However, after much deliberation, the Exec decided that our Society can play a more effective role by maintaining its independence from LAWF. Accepting membership would also mean accepting the LAWFs protocols for participation, which we felt would compromise our independent voice on freshwater issues. So NZFSS will continue to work with LAWF and its members, but as an independent professional body, which is what we are and what we should continue to be.

NZFSS CONFERENCE 2016 IN INVERCARGILL – "FRESHWATERS ON THE EDGE"

We have been involved in the planning of our annual conference in Invercargill from December 4–8. As I write this, abstract submissions have just closed and the conference planning committees are starting to build the conference programme. *Freshwaters on the Edge* promises to be a great conference, taking place in a setting which is on the doorstep of some of New Zealand's most amazing natural environments (e.g., Rakiura/Stewart Island, the Catlins, Fiordland, etc.). We hope that most of our members will be able to attend the conference and perhaps extend their stay to enjoy some Southern sites and outdoor experiences.

Finally, my job as President has been aided so much by the great people on the Executive Team and by many members of our Society who assist with our various functions (for example, writing submissions). I would like to specifically thank our wonderful secretary Janine Wech, Kate MacArthur and Richard Allibone for their efforts and expertise in relation to our submissions, David Hamilton for his sage advice and support, and Kati Doeiring and Natasha Petrove for their mammoth efforts in putting together our annual newsletter. If members have any thoughts or comments for me and/or the Exec, feel free to send those to us.

Best regards and I hope to see you at *Freshwaters on the Edge* in December.

Marc Schallenberg
PRESIDENT, NEW ZEALAND FRESHWATER SCIENCES SOCIETY ■

Radix auricularia found in the Ōtākaro/Avon River

Photo © EOS Ecology / Shelley McMurtrie

INVITED ARTICLES & OPINION PIECES





Radix auricularia seen through underwater viewer in Ōtākaro/Avon River. Note the large number of egg masses (yellow arrows).

Photo © EOS Ecology / Shelley McMurtrie

Exotic Snail Discovered in South Island Waterways

By Shelley McMurtrie & Emily Demchick,
EOS Ecology

The discovery of a large exotic snail in a South Island urban river has raised concerns regarding the spread of exotic aquatic species, as well as the role of processing laboratories in their early detection.

In late 2015, EOS Ecology discovered a large exotic snail *Radix auricularia* in the Ōtākaro/Avon River through the Christchurch CBD area. The snail was discovered during detailed habitat surveys using an underwater viewer, where the snails and egg masses were visible on the stream substrate. Collection of specimens confirmed their identification as the lymnaeid *R. auricularia*. Growing up to 25 mm in length, the snail is particularly large compared to most freshwater snails found in New Zealand, and based on the large number of egg masses, appears to be a prolific breeder. They were observed at three different riffle sections within the surveyed CBD area, where the river had recently undergone significant habitat improvements as part of the Te Papa Ōtākaro/Avon River Precinct revitalisation programme.

While *R. auricularia* is known from lakes in the North Island and more recently from a handful of lakes in the South Island, this is the first record of it from a lotic environment in New Zealand (Brian Smith, NIWA, pers. comm.). In addition to being the first observation of this snail in a waterway system, it is notable that they were also found within particularly fast flowing water. The available literature indicates that they are more typically found in ponds or lakes and silted habitats, and are often cited as preferring stagnant or very slow flowing environments. The sites at which they were observed in the Ōtākaro/Avon River were primarily faster flowing gravel/cobble habitats, and the snails were most abundant in open, sunny areas where algal growth was high. This preference for open environments has also been noted in overseas literature.

This exotic species has the potential to alter community composition, with a range of flow-on implications for waterway health and on-going waterway monitoring. In light of the recent habitat improvement works within this section of the Ōtākaro/Avon River, the presence of this species may make

it more difficult for post-works monitoring programmes to separate the roles of interspecies interactions and competition from physicochemical factors in any observed changes to community composition. Overseas they are a known vector for parasites, including trematodes (some of which may infect humans) and a human pharyngeal parasite, meaning they could also represent a future risk for human health.

These snails are known from the aquarium trade, and so it is likely that they were released from a fish tank. It reiterates the need for ongoing messaging to the public about the importance of not tipping fish tank water into the stormwater network or into waterbodies.

Early correct identification of exotic fauna is essential for early detection, which in itself may be crucial to controlling further spread and minimising the damaging impacts on native communities. *R. auricularia* belongs to the family Lymnaeidae, which includes several native and exotic species in New Zealand. However, *Radix* is not listed in the MCI-level taxa lists that are often used as the basic level of taxonomic resolution for invertebrate processing. It therefore raises the importance of the role of invertebrate processing laboratories in identifying new taxa when they appear in samples, irrespective of the predetermined identification level for the samples, as well as the value of adequate invertebrate identification skills. In addition, new records of exotic species should be reported to clients and the appropriate agencies or regulatory authorities (i.e., MPI Exotic Pests & Diseases Hotline: 0800 80 99 66) to help with maintaining an up to date record of new species distributions. ■



Celebrating World Fish Migration Day

By Sjaan Bowie,
DOC Technical Advisor – Freshwater / Mātanga Tāonga Wai Māori

World Fish Migration Day is a global event that brings attention to migratory fish and their need for open river systems. The day aims to highlight the need to safeguard free-flowing rivers and to restore connections in waterways for migratory fish. The second World Fish Migration Day was celebrated earlier this year on 22 May 2016.

Celebrations and events started in New Zealand, and followed the sun as 22 May dawned around the planet. There were over 450 events in 61 countries, varying from public education events, river tours, aquarium displays and dam removals, to playing a human board game called 'the migratory fish'.

New Zealand waterways are home to around 40 native freshwater fish and several sports fish species. Many of these fish species need to move up and down within our waterways, and migrate between freshwater and marine habitats to complete their lifecycles.

Structures such as culverts, weirs, fords, dams, and tide and flood gates are commonly found today in streams and rivers throughout New Zealand. If they are badly designed, not installed correctly, or change over time they can obstruct fish migrations to upstream and downstream habitats. So these structures can threaten our freshwater fish, and safeguarding open pathways in our waterways is one key action we can all be involved in to ensure freshwater fish are able to complete their lifecycles.

In New Zealand four official events took place to promote World Fish Migration Day. Richmond, Nelson had the privilege of officially opening the 2016 global event and Christchurch, Hamilton and Gisborne hosted local celebrations. Opportunities to promote the cause were also picked up in other locations such as the Hawke's Bay.

At all of the events, participants got the chance to interact

and learn about the importance of open rivers and pathways for fish. They also got the opportunity to see some of the special freshwater fish that live in New Zealand waterways. Among the handouts provided to attendees was the new 'awesome eels' children's activity sheet that was produced in partnership with the New Zealand Fish Passage Advisory Group and Riverscapes Freshwater Ecology (www.doc.govt.nz/Documents/conservation/native-animals/Fish/awesome-eels-activity-sheet.pdf).

The Christchurch event was held at Ōpāwa School and involved a number of freshwater specialists, representing 13 different organisations and groups¹, teaming up to create a fun-filled and educational interactive event. Over 500 children from preschools, schools and the public visited stations featuring our amazing native freshwater fish, sports fish, fish passage management and the local whitebait restoration project Whaka Inanka : Causing Whitebait.

Children got to see whitebait eggs up close, watch sports fish and whitebait trying to negotiate fish passes, see ways we can find out what fish are in our streams, and could take home freshwater stickers, colouring sheets, books and posters that were being handed out.

Check out the amazing video at www.youtube.com/watch?v=UavqLa7Ll6I&feature=youtu.be of the World Fish Migration Day, Christchurch event.

More information: www.doc.govt.nz/nature/habitats/freshwater/fish-passage-management ■

¹ Department of Conservation, EOS ecology (Whaka Inanka project), Marine Ecology Research Group (University of Canterbury), Fish & Game (Central South Island & North Canterbury), Environment Canterbury, Working Waters Trust, Christchurch City Council, Avon-Ōtākaro Network, Ngāi Tahu, New Zealand Fish Passage Advisory Group.



Sjaan Bowie (DOC) looking at the adult inanga (whitebait) on display.



Children watching little whitebait swim up the makeshift fish pass, and seeing how we can help them by putting rocks on smooth surfaces to slow the water down.



Children checking out some of the giant bullies on display at the native fish station.

We ♥ Whitebait

Whaka Īnaka : Causing Whitebait

By EOS Ecology

During the 2016 whitebait spawning season, we were proud to be part of the largest scale initiative of its kind providing much-needed spawning habitat for Christchurch's whitebait species – inaka (*Galaxias maculatus*).

Christchurch's rivers were once known for their plentiful spawning habitat and whitebait runs – early Pākehā settlers even referred to spawning inaka as 'cow fish' due to the fact the rivers turned milky white during the spawning season. "Sadly that legacy has been in decline for some time now, largely due to changes we have made to the riverbanks where they spawn," said Project Leader and Principal Aquatic Ecology Scientist at EOS Ecology, Shelley McMurtrie. The 2011 Canterbury earthquakes also changed the location of the 'salt water wedge' (where inaka spawn) due to a tilting of the estuary bed downstream, which increased the uncertainty of where the spawning grounds were in a post-earthquake Christchurch.

A collaboration with Te Rūnanga o Ngāi Tahu, K4 Cultural Landscapes (Te Marino Lenihan), and University of Canterbury's Marine Ecology Research Group (Mike Hickford) and Resilient Shorelines programme (Shane Orchard), the focus of Whaka Īnaka: Causing Whitebait is on stemming the decline of whitebait through the creation of temporary spawning habitats. Involving the installation of 204 straw bales at 34 sites along the lower reaches of the Ōpāwaho/Heathcote River and around Lake Kate Sheppard (between Travis Wetland and the Ōtākaro/Avon River), the project revealed locations along the rivers where inaka would be able to spawn if the conditions were more suitable.

The Whaka Īnaka project also sits at the heart of a priority aim in the earthquake recovery process – helping to improve

the mahinga kai (food gathering) values of Christchurch's waterways. "With a greater awareness of caring for our rivers and restoring the habitat for our mahinga kai species, our connection to our environment and its ability to feed its people, can also be restored," said Te Marino Lenihan of Ngāi Tūāhuriri and Whaka Īnaka project partner.

HOTELS FOR ĪNAKA

The brain child of Mike Hickford – straw bales provide ideal conditions for inaka to lay their eggs, keeping them safe and moist during their month-long gestation period. And what's more, the bales acted as a key talking point for the community. "The bales were easy to install and monitor, and acted as a kind of Hilton Hotel for inaka. In addition, they were also an invaluable way to engage with local community about inaka spawning – showing people the thousands of tiny eggs nestled between the bales is a real 'wow' moment for many," said Shelley.

The bales were in place throughout February to June 2016, and along with improving spawning success, they also showed where inaka could successfully spawn if habitat conditions were improved, thereby helping to provide a road map for future habitat restoration. Such long-term goals are strengthened with links to wider work on post-quake spawning by University of Canterbury (i.e., the Resilient Shorelines programme: www.resilientshorelines.nz).

CONNECTING WITH THE COMMUNITY

Resulting not only in the compilation of baseline data about inaka in post-earthquake Christchurch, Whaka Īnaka was also about connecting with the community to effect long-term



Kirsty Brennan from EOS Ecology working with local iwi and schools monitoring temporary spawning habitat.

Photo © EOS Ecology / Bronwyn Gay

positive change. “Whaka Īnaka was a great project – it was not just about biodiversity gains and the cultural significance of inaka within our freshwater environment, but was also very much about community knowledge gains,” said Alan McDonald, Supervisor, Community, Department of Conservation.

Local iwi and community were directly involved in the project, helping with the January bale installation day and June removal day, whilst some also committed to returning regularly during the spawning season to assist EOS Ecology scientists with monthly egg counts at the bale sites. Sixteen local schools signed up to participate in the Pest Monitoring Module of Whaka Īnaka (*see page 10*) – working on a roster basis to visit the bales to detect pests and monitor the condition of the bales. “The support of the local community and businesses, and of local iwi – some of whom travelled from Kaiapoi to be involved in the programme – was so heartening,” said Shelley. “It was a real honour to have them all be a part of Whaka Īnaka.”

The installation of information panels created by EOS Ecology at riverside bale sites, a Whaka Īnaka Facebook page, and attendance of Whaka Īnaka at four public events also widened the reach of the project to include a sense of stewardship by locals. Project volunteers involved in the monthly egg counts were pleased by the level of interest from the local community. “I was so surprised at how protective the neighbourhoods were with the bales – every time we were out there working, local people came and asked questions about the project,” said Sarah, a Whaka Īnaka volunteer.

A survey of the project volunteers also showed that they would now definitely support restoration efforts to permanently restore habitat. “If we are looking after the river, then we are looking after the people... If we are taking care of the river, that means people are involved, and their wellbeing is being taken care of too through their connection to the natural world,” said Teoti, a Whaka Īnaka volunteer and takata tiaki for the Avon-Ōtākaro Network.

The programme has been successful in both improving spawning success and in engaging with the community and regulatory authorities to engender support for long-term improvements. “We all have a part to play in the future of our city’s whitebait population. From councils through to residents – we all have the ability to effect positive change in the way we care for the riverbanks where these iconic fish spawn,” said Shelley. “Whaka Īnaka has been a great catalyst for enthusing people about how to look after their river’s spawning grounds, and I look forward to seeing this enthusiasm reflected in long-term habitat restoration/bank maintenance changes”.

1. Volunteers stacking bales for installation day.
2. Josie & Tom checking a steep bale set for eggs.
3. Sjaan from DOC & Shelley from EOS Ecology share their knowledge with local school students.
4. The painstaking work of counting eggs.
5. Mike Hickford from UC & Shelley with their stunt inaka at World Fish Migration Day.
6. Examples of the extensive media coverage, signage & publicity for Whaka Īnaka.

Photo © EOS Ecology



The sign of success – inaka eggs found in temporary spawning habitat during project monitoring.

Photo © EOS Ecology / Shelley McMurtrie



1.



2.



3.



4.



5.

6.

IDENTIFYING INAKA/WHITEBAIT EGGS



STUDENT NEWS



Kia ora folks,

Fresh from having just submitted my abstract for the Invercargill NZFSS talk, it's scary how fast it has gone by! The final year of PhD has kept me pretty busy (looking forward to submitting!). Being my final year (hopefully) also means that I won't be a student next year; hence I'll be stepping down from the student rep role. Firstly, thank you very much to all of you fellow students for having me as your rep for the last two years. It has been a really interesting experience where I have been able to advocate for students' interests in the society. It has been great getting insights into how a scientific society operates and to be part of a motivated committee that really is concerned about student interests.

Now to my second point, have YOU considered being the society's student rep? You should, I can strongly recommend it. Students are a pretty special part of the society and also have their own distinct ideas for what they want to get out of the society. For students that I have spoken with, what they want to get out of the society falls into three main themes:

- Meet/network with potential future employers/supervisors
- Meet with students from other institutions
- To have fun at the meetings

That last point came from just one person but I suspect that they were just the only honest person. Going to your first scientific conference is quite intimidating. This gives some pretty clear starting guidelines for the next person (or people) to take on the role. Furthermore, I would love to work alongside the next rep to help with the transition as much as possible.

In the meantime, the Invercargill meeting is shaping up to be a great week. I look forward to catching up with many of you down there and hearing more about what research has been done during the year.

Simon Stewart

STUDENT REPRESENTATIVE, NZFSS COMMITTEE ■

CRITTER OF THE YEAR 2016

By Karen Shearer

Ameletopsis – Beauty & the Beast (the elusive ‘pirate’ of our waterways)

This year I’m going to focus on an animal that has been described by many famous anglers as an ‘unusual and beautiful insect’ or ‘the prettiest of mayflies’ – *Ameletopsis*. I asked my avid-fishermen colleagues whether this was true, and they all assure me that if you were going to wax lyrical about a bug – this would be the one. So here goes...

A widely distributed yet somewhat elusive mayfly, the adult of *Ameletopsis* is known to anglers as the Sulphur dun – so named for the beautiful bright yellow colouration of the adult (see beautiful photo below). The nymph is less colourful, but no less unusual. Its large head and eyes, oddly enough, resemble a human skull. To add to its charm, this little pirate is our only carnivorous mayfly – using its sickle-like mandibles to prey on other aquatic insect larvae (see scary photo below!).

Ameletopsis perscitus is the single member we have in NZ belonging to the family Ameletopsidae, which, according to Wikipedia, is a ‘family group of one-hit wonders’ as they are found only in the Southern hemisphere. There’s no accounting for good taste. In other countries, members of this family are night-active – with a tendency to dig into the substrate during the day. This may explain a bit about its elusiveness in NZ rivers. I recall one occasion, a few years ago now, when a colleague came back from a nocturnal field trip up the Cobb River in Golden Bay exclaiming the riverbed was literally

crawling with *Ameletopsis* larvae – entirely contrary to what we had seen, or collected, during the day.

Ameletopsis is usually found in some dark still backwater or a shallow, slowly-flowing portion at the edge of a stream. Here, like any good pirate, it sets up an ambush. It will lie perfectly still on a stone or in a crevice with its camouflage colouring making it very difficult to detect. At times, it will walk forward with a gliding motion for a few inches, ‘freeze’... and then move forward again. It has also been known to peer cautiously round the edge of a stone and stalk slowly forward. And no, I’m not making this up.

When disturbed, *Ameletopsis* can move with considerable speed, swimming strongly with quick, somewhat jerky movements of its body. A lot like me in the swimming pool, except for the speed and swimming strongly bit.

Ameletopsis becomes full-grown from December to March attaining sizes of up to 18 mm in length. The late instar larva then crawls onto a stone above water-level, to begin its transformation from an awkward little delinquent into the beautiful eye-catching adult adored by anglers, invertebrate biologists, and fish (when they can get them).

Have I ‘waxed lyrical’ about the sulphur dun folks? Perhaps not. But what little is known about these amazing mayflies is certainly interesting, and provides an insight into the beast behind the beauty. ■



The beautiful adult.



Sickle-like mandibles.



Ameletopsis larva.

Reference material used in article was sourced from:

Marsh, N. 2004: Trout Stream Insects of New Zealand: How to imitate and use them. Halcyon Publishing Ltd., Auckland. 244p.

Phillips, J.S. 1930: A revision of New Zealand Ephemeroptera. *Transactions of the N.Z. Institute* 61: 271–390.

translate.google.co.nz/translate?hl=en&sl=no&u=https://no.wikipedia.org/wiki/Ameletopsidae&prev=search

www.landcareresearch.co.nz/resources/identification/animals/freshwater-invertebrates/guide/jointed-legs/insects-and-springtails/mayflies/swimming-mayfly
naturewatch.org.nz/taxa/385416-Ameletopsis-perscitus

Vigorous assistant, Mike Winterbourn, leading the charge
during mayfly surveys in the Ben Ohau Range, Twizel.
Mike was a quick learner...or perhaps he'd done it before.

Photo © Steve Pohe

RESEARCH NEWS



UNIVERSITIES

University of Canterbury Freshwater Ecology Group (FERG)

New: Chris Meijer (MSc student)



It's been a busy year for the FERG crew with on-going field and lab work and travel to overseas conferences. A few highlights:

- Jon Harding became a DDoG (Dean of Postgraduate Research at the University of Canterbury).
- Catherine Febria and her family welcomed their sweet little girl, Stella.
- Amanda Klemmer and Hamish Greig (former FERGies now based at the University of Maine) welcomed their darling daughter, Evelyn, to the world.
- Brandon Goeller pulled on the boxing gloves and jumped in the ring to raise funds for Bowel and Liver Trust through the UCSA Charity Boxing Fight night.
- Katie Collins travelled to Nepal to represent New Zealand at the Asia Pacific World Guiding Conference.



Photo © self-timer

Successful shade tunnel experiment setup on an agricultural waterway by the CAREX crew

CAREX

👤=8

Nitrate Management in Agricultural

Waterways – Trialing stream rehabilitation tools to attenuate nitrate export and improve stream health in agricultural waterways. **Staff involved:** Brandon Goeller (PhD student), Jon Harding, Angus McIntosh, Catherine Febria **Outputs:** Goeller *et al.* 2016

Macrophyte Management in Agricultural

Waterways – Testing and developing tools for macrophyte management in Canterbury. **Staff involved:** Katie Collins (PhD student), Jon Harding, Angus McIntosh, Hayley Devlin, Helen Warburton **Collaborators:** Waimakariri District Council (Greg Bennett)

Identifying Scale of Stressors & Rehabilitation Tools for Stream Restoration

– Trialling combination of 14 tools at different scales in a regional experiment of nine agricultural waterways. **Staff involved:** Catherine Febria, Jon Harding, Angus McIntosh, Helen Warburton, Kristy Hogsden **Collaborators:** ESR (Meg Devane), Living Water (Robin Smith), Waimakariri District Council (Greg Bennett), Environment Canterbury (various)

Invertebrate Natural History & Ecology

👤=2

Mayfly Ecology – Assessing mayfly distribution, body size, and phylogenetic relationships across latitudinal and altitudinal gradients. **Staff involved:** Steve Pohe (PhD student), Jon Harding, Mike Winterbourn **Collaborators:** UC (Sharyn Goldstein)

Dragonfly Ecology – Documenting the natural history and exploring the ecological implications of the arrival of *Tramea loewii*. **Staff involved:** Steve Pohe, Mike Winterbourn **Collaborators:** NorthTec (Olly Ball, Tyler Matheson) **Outputs:** Matheson *et al.* 2015

Ecology of *Stenoperla* – Assessing adult feeding, parasitism, body size and phylogeographic relationships across New Zealand. **Staff involved:** Mike Winterbourn, Steve Pohe **Collaborators:** UC (Sharyn Goldstein) **Outputs:** Winterbourn & Pohe 2016

Fish Ecology

👤=5

Spatial Patterns in Fish Communities –

Investigating riverscape complexity effects on spatial patterns in fish diversity in abundance. **Staff involved:** Nixie Boddy (PhD student), Angus McIntosh **Collaborators:** NIWA (Phil Jellyman, Doug Booker)

Fine Sediment Effects on Fish Communities

– Documenting the natural history and exploring the ecological implications of the arrival of *Tramea loewii*. **Staff involved:** Nicky Glenjarman (MSc student), Jon Harding

Improving Conservation of Canterbury Mudfish

– Assessing the impacts of drought intensity on population dynamics and food web structure to facilitate an increased likelihood of mudfish translocation success. **Staff involved:** Chris Meijer (MSc student), Angus McIntosh

Food Webs

👤=7

Mining Impacts on Food Webs –

Investigating how acid mine drainage affects freshwater food webs, and evaluating methods for food web construction and modelling. **Staff involved:** Justin Pomeranz (PhD student), Jon Harding, Angus McIntosh, Kristy Hogsden, Helen Warburton, Steve Pohe **Collaborators:** NIWA (Phil Jellyman)

Influence of Stream Flow on Trophic Position & Body Size of Fishes –

Characterising food webs across flow, hydrological disturbance, and land use gradients. **Staff involved:** Kevin Fraley (PhD student), Angus McIntosh, Helen Warburton **Collaborators:** NIWA (Phil Jellyman)



Electrofishing the Bealey Gorge in Arthurs Pass.

Photo © self-timer

Russell Death has been working on a variety of projects through 2015. He developed some nitrate and DRP limits for New Zealand rivers from a variety of evidence sources and has submitted a manuscript on the work to Marine and Freshwater. He has continued his work on modelling tuna populations in a BBN to assist local iwi groups in awa management, although **Miriam Niessen** who was working with him on the project has moved on to paid employment at Horizons. He has also been working with **Jono Tonkin** and **Dave Lytle** from Oregon State University on fitting current models of metacommunity theory to invertebrate community data from a latitudinal survey of New Zealand. His work with **Ian Fuller** on balancing flood control and the preservation of river geomorphology using the Habitat Quality Index is also currently being expanded to include assessment of native fish habitat. Finally, he has started research on how best to measure threatened freshwater invertebrate biodiversity with a group of riverine invertebrate conservation scientists (**Kevin Collier, Jon Harding, Rosemary Miller, Natasha Grainger, Brian Smith, Stephen Pohe, Richard Leschen** and **Ian Henderson**).

Yen Dinh is progressing well through her PhD on aquatic invertebrates as indicators of climate change. She has drafted a manuscript looking at the traits of invertebrates associated with flood disturbance. She has also been hard at work processing samples from flood studies of Wellington and Fox Glacier collected in 2015.

Adam Canning is still playing with Hutt river/estuary food webs to see how primary productivity and introduced predators may affect the community stability. He is also testing the impact of nitrate on invertebrate composition using mesocosms, though can't seem to get anything but snails to grow. He is in the final stages of putting all this together into what resembles a PhD thesis.

Andrew Neverman is continuing his PhD studies focusing on getting bedload impact data both in New Zealand and Italy. His main progress has come from installing instrumentation in the Rio Cordon, Italy which has recorded its first event. He is now waiting for the appropriate flood events and collecting sufficient data to complete his thesis write-up.

Jo Taylor is in the very early stages of literature review and study planning for a Masters in Ecology investigating the effect of nutrient levels on stream invertebrate recovery following flooding.

Lovisa Ekelund from Mexico is also in the early stages of her Masters in Environmental Management investigating the conservation status of several Wairarapa wetlands in terms of their macroinvertebrate communities, fish, plants, and birds.

Mike Joy has been writing evidence on waterway impacts for two Treaty of Waitangi Claims, one for the Māori Council (Wai 2358) and the other for Ngāti Raukawa. He has upgraded the fish IBI to include fish abundance and density for Horizons Regional Council, and helped on another for BOP. His work with the Landcorp Environmental Reference Group has meant traveling all over New Zealand to see what is happening first hand and helping to come up with sustainable solutions to agricultural issues. He is excited about the opportunities for change at Landcorp some seen already with end of PKE and the chance that what Landcorp does might lead the way for other farmers.

Fish Ecology

👤=9

Early Life-history of Amphidromous Fishes

– Examining the early life-history (larval ecology and migration) of New Zealand's native fishes. **Staff involved:** Gerry Closs, Matt Jarvis, Jason Augspurger, Mahsa Toorchi, Jane Goodman **Collaborators:** Waikato Regional Council (Bruno David), Hawkes Bay Regional Council (Andy Hicks)

Estuarine Fish Ecology – Examining the role estuaries play in the life-histories of fish species, including freshwater, estuarine and marine fishes. **Staff involved:** Fasil Taddese, Gerry Closs, Matt Jarvis **Collaborators:** Waikato Regional Council (Bruno David), Hawkes Bay Regional Council (Andy Hicks)

Salmonid Ecology – Examining the drivers of migration in brown trout. **Staff involved:** Pavel Mikheev, Jeremy Xu, Gerry Closs, Matt Jarvis, Morgan Trotter **Collaborators:** Otago Fish and Game, Clutha Fisheries Trust

Lakes Group (Lakes)

👤=3

Lake Pelagic Food Web Manipulation for Lake Restoration – Can fish biomass be manipulated to facilitate a trophic cascade favouring *Daphnia* and reducing phytoplankton? **More details:** www.scene.co.nz/queenstown-news/boffins-study-lake-hayes-algae

Lake Snot/Snow – Is *Lindavia intermedia* (a.k.a. *Cyclotella bodanica*) a new invader of our oligotrophic lakes? Is there an environmental component to its recent proliferation? **More details:** www.stuff.co.nz/science/81151269/What-can-be-done-to-stop-lake-snot **Outputs:** Weaver *et al.* (in review)

Historical Trajectory of Lake Health –

Reference condition and historical drivers of eutrophication in lakes. **Outputs:** Schallenberg & Saulnier-Talbot 2015

Ecological Feedbacks Conferring Ecological Resistance & Resilience –

Identifying and enhancing ecological feedbacks to increase lake resilience to anthropogenic pressures. **More details:** contact marc.schallenberg@otago.ac.nz

For all Lakes projects – Staff involved: Marc Schallenberg, Gerry Closs, Carolyn Burns **Collaborators:** University of Waikato (many), Cawthron (Susie Wood and Dave Kelly), DOC (Hugh Robertson, Emily Funnell), NIWA (Piet Verburg, John Quinn, Scott Larned), Environment Southland (Clint Rissmann, Nick Ward, James Dare)

Lakes Group (Coastal Lake/Lagoons (ICOLLs))

👤=2

Within-ICOLL Nutrient Processing – How do denitrification and internal P loading affect nutrient availability in ICOLLs? **Outputs:** Schallenberg & Crawshaw 2016

Ruppia Dynamics & Ecosystem Services

– What are the drivers of spatial and temporal variation in *Ruppia* abundance in Waituna Lagoon? What ecosystem services are associated with *Ruppia*? **Outputs:** Schallenberg *et al.* 2016

Historical Trajectory of Lake Health –

Reference condition and historical drivers of eutrophication in ICOLLs. **Outputs:** Schallenberg *et al.* 2016

Ecological Feedbacks Conferring Ecological Resistance & Resilience –

Identifying and enhancing ecological feedbacks to increase ICOLL resilience to anthropogenic pressures. **More details:** Contact marc.schallenberg@otago.ac.nz

For all ICOLLs projects – Staff involved: Marc Schallenberg, Candida Savage **Collaborators:** Environment Southland (Clint Rissmann, Nick Ward), NIWA (John Quinn, Scott Larned), University of Waikato (David Hamilton, Moritz Lehman)

Josie Crawshaw spiking in situ enclosures
measuring denitrification rates in Te Waihora/
Lake Ellesmere with ^{15}N -nitrate.

Photo © M. Schallenberg



Josie Crawshaw and Sorrell O'Connell-Milne
using oxygen microelectrodes to measure
oxygen penetration depths in sediment cores
from Te Waihora/Lake Ellesmere

Photo © M. Schallenberg



Lake Resilience (Waikato)

👤=6

Remote Sensing of NZ Lakes – A nationwide project to establish the critical drivers of lake resilience for restoration needs (MBIE-funded)

New Models of Trophic Cascades in Lake

Tākiwa – A Geospatial Platform for Lake Data

New Sensor Technologies for Automatic Monitoring

Staff involved: David Hamilton, Kevin Collier, Moritz Lehmann, Brendan Hicks, Ian Duggan, Chris McBride (as PhD student) **Collaborators:** NIWA (John Quinn, Clive Howard-Williams, Piet Verburg, Sandy Elliot), University of Otago (Marc Schallenberg), Cawthron (Susie Wood, Dave Kelly) **More details:** Multiple end users: WRC, BOPC, ECan, Horizons and many others. **Outputs:** See 'Recent Publications'.

Chair in Lake Restoration (Bay of Plenty)

👤=5

The Chair in Lake Restoration at the University of Waikato is funded by Bay of Plenty Regional Council to support their science requirements for lake management.

The Lakes Chair works closely with Bay of Plenty Regional Council (Andy Bruere) in lake science provision. **Outputs:** See 'Recent Publications'.

Modelling of Lake Rerewhakaaitu

Paleolimnology of Lake Okataina

Greenhouse Gas Emissions from Rotorua Lakes

Ohau Channel Diversion Consent

Toxicological Review of Alum Dosing

Staff involved: David Hamilton, Chris McBride, Brendan Hicks, Moritz Lehmann, Grant Tempero, Christopher Dada **Collaborators:** NIWA (Piet Verburg), GNS (Paul White)

China-NZ Collaboration in Freshwater (China)

👤=4

Water Quantity & Quality Modelling Workshops in China & New Zealand

– A range of lake water quality research projects. **Staff involved:** David Hamilton, Chris McBride, Brendan Hicks, Moritz Lehmann, Eunju Cho **Collaborators:** NIWA (John Quinn, Clive Howard-Williams, Alan Grey, Sandy Elliot, Max Gibbs, David Plew), GNS Science (Christopher Daughney), Richard Muirhead (AgResearch) **More details:** Active involvement in positons, partnerships and leadership roles with Chinese institutions (e.g., Nanjing Institute of Geography and Limnology). **Outputs:** Workshop on water quantity and quality modelling held in Wuxi, China (May 2016).

Nutrient Dynamics in Lakes (Waikato)

👤=6

Resolving Food Webs in Waikato Shallow Lakes, with Waikato Regional Council

– (i) resolving food webs in Waikato shallow lakes, with Waikato Regional Council (ii) quantifying the ecological role of freshwater mussels. **Staff involved:** Kevin Collier **Collaborators:** Waikato Regional Council (Mike Pingram, Deniz Ozkundakci) **More details:** This project is part of a larger lakes research programme aimed at understanding factors affecting the resilience of lakes to multiple stressors, including the influence of water biota through. **Outputs:** In progress.

Quantifying the Ecological Role of Freshwater Mussels

– **Staff involved:** Kevin Collier **Collaborators:** Sue Clearwater (NIWA) and Susie Wood (Cawthron) **More details:** Another study has been conducted on the effects of food type on biodeposition. **Outputs:** A manuscript on mussel nutrient excretion rates, led by visiting scientist Helene Cyr of the University of Toronto, has been submitted for publication.

Nutrient Excretion by Freshwater Fish

– Predictions of establishment risk highlight biosurveillance priorities for invasive fish in New Zealand lakes. **Staff involved:** Brendan Hicks, Kevin Collier, Nicholas Ling, Glen Stichbury **Collaborators:** John R. Leathwick **More details:** The ability to predict invasive species spread is essential for effective biosecurity management and the allocation of scarce monitoring resources. used field survey data from 470 New

Zealand lakes to fit statistical models of the current geographic distributions of seven introduced species; the resulting models were then used to predict risks of future establishment of each species in 3595 New Zealand lakes >1 ha. **Outputs:** See recent publications section.

Shallow Lakes Modelling – Modelling of the nutrient dynamics and ecology of 4 shallow Waikato lakes: Ngaroto, Waikare, Waahi, Rotomanuka. Part of the Healthy Rivers: Plan for Change/Wai Ora: He Rautaki Whakapaipai involves establishing nutrient load limits for selected shallow riverine lakes. The modelling is being used to help define those limits. **Staff involved:** Moritz Lehman, David Hamilton, Brendan Hicks, Kohji Muraoka **Collaborators:** Deniz Ozkundakci (Waikato Regional Council), David Burger (DairyNZ)

Fish Life Histories

(International)

=2

Inanga Life Histories in NZ, Chile, & Australia – This study presents an extensive multi-country evaluation of the life histories of inanga (NZ threat status: At Risk, Declining) in NZ, Chile and Australia. **Staff involved:** Nicholas Ling, Brendan Hicks **Collaborators:** Konrad Górski (University of Concepcion, Chile); Dianne Gleeson (University of Canberra) **Outputs:** In progress.

GOVERNMENT ORGANISATIONS & CROWN RESEARCH INSTITUTES

Department of Conservation



Department of
Conservation
Te Papa Atawhai

👤=18 / **New:** Tracie Dean-Speirs / **Left:** Katie Brasell, Ben Woodward

National Freshwater Team

Fish Passage – Continued to work with NIWA to lead coordination of the NZ Fish Passage Advisory group. Key progress has included identifying key research gaps, applying for funding to create a national assessment protocol and guidelines, developing further case study guidance to illustrate different approaches to restoring fish passage, scoping and developing new national fish passage management guidelines, improving communication around fish passage management, and promoting our message through initiatives like World Fish Migration Day. **Staff involved:** Sjaan Bowie & Dave West **Collaborators:** Paul Franklin (NIWA), and wider NZ Fish Passage Advisory Group **Outputs:** see doc.govt.nz/fishpassage and case studies www.doc.govt.nz/nature/habitats/freshwater/fish-passage-management/how-you-can-help

Freshwater RMA Guidance Documents –

Developed further guidance documents for RMA advocacy, including: i) finalising the hydro and water storage dams, diffuse nutrients, drain maintenance and water abstraction guidance documents; and ii) review of the forestry guidance by industry representatives. **Staff involved:** Natasha Petrove, Amber McEwan, Ben Woodward, Katie Brasell, Martin Rutledge & Philippe Gerbeaux

Invasive Fish Management Handbook –

Co-editing and publication of the handbook, along with development of a statement of priorities for DOC invasive fish management. **Staff involved:** Natasha Grainger **Collaborators:** Waikato University **Outputs:** www.doc.govt.nz/Documents/conservation/threats-and-impacts/animal-pests/nz-invasive-fish-management-handbook.pdf

Resources for Native Fish Habitat

Restoration – Working on editing and finalising a literature review on habitat requirements for ten native freshwater fish (written last year with Amber McEwan, Riverscapes Freshwater Ecology), and to build on this, currently undertaking an inventory of habitat restoration techniques for different habitat types. This will be presented as a series of case studies on the DOC website when complete. **Staff involved:** Natasha Petrove, Anna Paltridge & Emily Funnell **Collaborators:** Richard Montgomerie & Greg Burrell

Identifying Outstanding Waterbodies –

Progressed development of guidance related to identifying outstanding waterbodies. **Staff involved:** Dave West **Collaborators:** Golder Associates, Hawkes Bay Regional Council & Auckland Regional Council

Ramsar Guidelines –

Published the Ramsar Guidelines to provide guidance to potential applicants on criteria and process for nominating sites as internationally significant under Ramsar. **Staff involved:** Hugh Robertson **Collaborators:** Karen Denyer **Outputs:** Denyer & Robertson 2016

Classification System for Estuaries –

Completing the development of a classification system for estuaries. **Staff involved:** Philippe Gerbeaux **Collaborators:** NIWA & MfE **Outputs:** Hume *et al.* (in press)

Arawai Kākāriki Wetland Restoration

Programme – New system of report cards developed to report on key outcomes at the large scale freshwater sites: Whangamarino Wetland (Waikato), Ō Tū Wharekai (Canterbury) and Awarua-Waituna (Southland). **Staff involved:** various **Outputs:** report cards (www.doc.govt.nz/our-work/arawai-kakariki-wetland-restoration/report-cards/) and recent reports (www.doc.govt.nz/our-work/arawai-kakariki-wetland-restoration/science-and-research-reports)





Various Publications – Published a paper on using environmental DNA to monitor trout eradication from banded kōkopu habitat; published a book chapter on successful lake restoration; and authored or co-authored chapters in the upcoming text book ‘Advances in Freshwater’ on wetlands, stream fish communities, freshwater conservation and freshwater fisheries management. **Staff involved:** Dave West, Philippe Gerbeaux & others **Collaborators:** Cawthron Institute, Colorado State University, NIWA & Otago University **Outputs:** Banks *et al.* 2016.; Rowe *et al.* (in prep)

Species Database Work – Sought out un-entered fishing records from organisations around NZ and entered them in the NZFFD, to contribute to an up-to-date database. Collated threatened invertebrate records into a geodatabase. **Staff involved:** Nicholas Dunn, Natasha Grainger, *et al.* **Collaborators:** MfE

Living Water – Farm biodiversity assessments; riparian, habitat and species management; monitoring; ecosystem services modelling; and social research, as part of the DOC–Fonterra partnership. **Staff involved:** DOC Operations staff, with support from the Freshwater Team at five sites around the country. **Collaborators:** Fonterra **Outputs:** www.livingwater.net.nz/#home

Canterbury – Twizel

Site Protection of Non-migratory Galaxias Species – Through trout removal and installation of built barriers. A number of barriers have been installed into key non-migratory galaxias locations in Canterbury, and trout removed using electrofishing to protect lowland longjaw galaxias and bignose galaxias. Working with ECan to apply for a global consent for built barriers to protect non-migratory galaxias. Work is continuing to collate, analyse and write up past species monitoring and management. See www.stuff.co.nz/timaru-herald/news/82674669/trout-barriers-in-south-canterbury-streams-to-save-critically-endangered-native-fish for more info **Staff involved:** Dean Nelson (Twizel), Daniel Jack, Rosemary Clucas, Ciaran Campbell (Otago) & Sjaan Bowie **Collaborators:** ECan & Central South Island Fish and Game Council

Central Otago

Barrier Installation to Protect Threatened Non-migratory Galaxias Species – Installation of concrete barrier into Swin Burn and perched culvert to protect large population of Central Otago roundhead galaxias. Used electric fishing methods to capture brown trout and eDNA techniques (provided by Cawthron) to monitor successful removal. **Staff involved:** Daniel Jack & Ciaran Campbell **Collaborators:** Jonathon Banks (Cawthron Institute)

Otago – Wanaka

Pest Fish Removal – Responding to another illegal release of goldfish into public ponds, using electric fishing methods and netting. **Staff involved:** Daniel Jack & Paul Hondelink **Collaborators:** Aaron Horrell (Clutha Fisheries Trust), Paul van Klink (Otago Fish & Game) & Queenstown Lakes District Council

1. & 2. DOC Freshwater Technical Advisors doing a fish survey in the Ararira catchment as part of Living Water programme. [Photo © Living Water] / 3. Living Water team at Te Waihora – Ararira/LII River catchment. [Photo © Living Water] / 4. Bignose lowland longjaw galaxias found during survey of Fraser Spring. [Photo © Natasha Petrove] / 5. Bickerstaffe Creek, Central Otago. [Photo © Herb FAMILTON]



Auckland – Urban

 =7

Urban development Decision Support System (DSS)

– Suite of models that use indicators of the four well-beings to provide assessment of freshwater and estuarine outcomes of urban development scenarios.

NPS-FM Implementation in Urban

Catchments – Aim is to provide tools to assist councils regarding limit-setting in urban catchments.

Staff Involved: Jonathan Moores, Sharleen Yalden, Jenni Gadd & Annette Semadeni-Davies **Collaborators:** Cawthron Institute, Gail Tipa **Outputs:** publication list at sustainablecities.org.nz/resilient-urban-futures/urban-water-bodies **More Details:** See www.niwa.co.nz/freshwater-and-estuaries/stormwater-management/urban-impacts for more details

monitoring. **Staff Involved:** Richard Storey, Aslan Wright-Stow & Elizabeth Graham **Collaborators:** NZ regional and city councils (especially Taranaki Regional Council) & Georges River Combined Councils (NSW, Australia) **Outputs:** Guidelines to installing wood in small streams, NIWA website, soon to be released; Storey *et al.* (in press); Storey *et al.* 2016; Wright-Stow *et al.* (submitted); Wright-Stow & Wilcock (submitted).

Macroinvertebrate Dispersal – Investigation of dispersal capabilities of macroinvertebrates in urban, rural and intermittent streams to inform stream restoration design.

Staff Involved: Elizabeth Graham, Richard Storey, Brian Smith & Glenys Croker **Collaborators:** Auckland Council; Taranaki Regional Council & University of Waikato **Outputs:** Auckland Council technical report; Storey *et al.* (submitted).

Lake Restoration & Water Quality – We have investigated nutrient limitation status in lakes, the interaction between zooplankton and water quality and the impacts of invasive species. We have established techniques to manage phosphorus release from lake sediments and developed and applied a tool to determine the source(s) of sediment in a catchment, based on the use of compound-specific stable isotopes (CSSI). **Staff Involved:** Max Gibbs & Piet Verburg **Collaborators:** DairyNZ, NZ Regional/City councils & International Atomic Energy Agency (IAEA) **Outputs:** Lake Restoration Handbook (Gibbs 2016; Gibbs *et al.* 2016; Verburg *et al.* 2016); NIWA client reports.

Hamilton – Freshwater Ecology =11

New: Ellie Gee, Peter Williams

Left: Jacques Boubée, Josh Smith

Protection & Restoration of Freshwater Fish & Control of Invasive Species

– Research to improve our understanding of fish passage and spawning habitats for native fish (e.g. whitebait and lamprey), and develop control tools for management of invasive fish species (e.g. perch). This knowledge is being used to develop new guidance and restoration tools to protect and enhance native fish in NZ. Upcoming work will examine recruitment and dispersal constraints on native fish populations. For more details see www.doc.govt.nz/fishpassage. **Staff Involved:** Cindy Baker, Paul Franklin, Eleanor Gee, Kathryn Reeve & Peter Williams **Collaborators:** University of Canterbury (Mike Hickford), DOC (Sjaan Bowie), Te Rūnanga o Ngāi Tahu (Jane Kitson), Waikato Raupatu River Trust (Nicholas Manukau), New Zealand Fish Passage Advisory Group, University of Otago (Neil Gemmell), University of Manitoba (Margaret Docker) & University of Michigan (Weiming Li) **Outputs:** NZ Fish Passage Guidelines 2016; Franklin *et al.* 2015; Baker *et al.* (in press).

Improved Riparian Management & Freshwater Community Monitoring

– The team have been investigating how on-farm and riparian mitigation practices influence stream condition & whether volunteers can usefully extend and complement professional water

Hamilton – Chem & Ecotox =7

Nitrate Toxicity to Native Fish – Chronic tox testing of multiple native species.

Kākahi & Kōura Contaminant Tolerances & Habitat Requirements – Stream habitat evaluation for kākahi.

Kākahi Shell Microgeochemistry – Tracking kākahi shell microgeochemistry for a year and linking it to environmental conditions.

eDNA Probes for Kākahi – UoW is developing eDNA probes for 3 species of kākahi.

Staff Involved: Chris Hickey, Sue Clearwater, Karen Thompson & Anthea Albert **Collaborators:** University of Waikato (Collier, Lee), Waikato Regional Council (Hamer) & University of Macquarie (D. Jacobs)



One of the NIWA photo competition entries of Lake Rotorua.

Photo © @shannon_crow



One of the NIWA photo competition entries.

Photo © @shannon_crow

Fish & Game New Zealand

New: Jacob Lucas, Erin Garrick (Field Officer)

Left: Peter Wilson (Environmental Officer), Maurice Rodway (Former Manager)



Eastern Region

👤=12

Fisheries

Lake Waikaremoana Trout Fishery Study

– Ongoing study around spawning timing, angler usage/harvest. **Staff Involved:** Matt Osborne

Lake Tarawera fishery study – Investigation into factors affecting size/condition of Tarawera trout and techniques for smelt monitoring. **Staff Involved:** Andy Garrick, Matt Osborne & Mark Sherburn **Collaborators:** Michel Dedual (DOC Taupō)

Waterfowl

Identification of Remnant Wetland Sites that May be Enhanced for Waterfowl –

Through aerial reconnaissance, properties with degraded wetlands can be identified following which approaches can be made to landowners for restoration efforts. **Staff Involved:** Matt McDougall & John Meikle

Use of Swan Trend Count Data as a Tool to Indicate Changes to Water Quality Within Aquatic Systems –

Swan inhabit areas with healthy macrophyte beds and changes in swan numbers may raise indicate degrading water systems, e.g. Lake Tutira, Runanga and Whakaki Lagoon. **Staff Involved:** Matt McDougall **Collaborators:** Hawkes Bay Fish & Game

Nelson/Marlborough Region

👤=5

Minimum Flow Requirements for Regional Plan Reviews –

A range of fisheries and habitat assessments are ongoing to support submissions on environmental flows for streams and rivers across the NM Region. **Staff Involved:** all

Didymo Limiting Factors – Percent didymo cover of substrate, and water chemistry correlations are being investigated at two locations this summer. **Staff Involved:** Rhys Barrier **Collaborators:** NMIT (Keith Nolan) & NIWA (Cathy Kilroy)

Backcountry Fisheries Monitoring –

Population and user surveys are planned to improve our understanding of increasing angling pressure from both tourists and locals on these sensitive fisheries. **Staff Involved:** all

100 ha Para Wetland Restoration –

Enhancement of habitat through willow removal, native planting and open water creation. **Staff Involved:** Vaughan Lynn **Collaborators:** NZ Gamebird Habitat Trust

West Coast Region

👤=3

West Coast Salmon Otolith Research – Salmon otolith analysis to investigate the contribution of released salmon into spawning survey sites for fisheries enhancement.

Staff Involved: Lee Crosswell **Collaborators:** University of Waikato

Mawheraiti River Monitoring – Research and monitor factors affecting trout life history in the Mawheraiti River. **Staff Involved:** Lee Crosswell

Backcountry River Surveys – Assessment of angler usage in the Mokihinui and Karamea River catchments to assess fishery pressure. **Staff Involved:** all

North Canterbury Region

👤=7

Habitat Restoration: Ellesmere spawning Streams, Wairarapa Stream & High Country Salmon Spawning Streams –

Restoration of habitat, including sediment removal and fencing, has enhanced trout and salmon spawning habitat, and improved stream habitat for native fish and invertebrates. **Staff Involved:** Emily Arthur-Moore **Collaborators:** DOC, Selwyn District Council, University of Canterbury, Christchurch City Council & ECan

Water Quality & Habitat Monitoring of Key High Country Salmon Spawning Streams –

Three year study of the effects of unregulated intensification in the Canterbury high country on spawning streams. **Staff Involved:** Steve Terry & Tony Hawker **Collaborators:** ECan

Fish Screen Monitoring – Assisting ECan with assessing the effectiveness of fish screens and their compliance with consent conditions. **Staff Involved:** Steve Terry & Tony Hawker **Collaborators:** ECan

Hydro Canal Fisheries Harvest Survey –

Estimate total sports fish harvest throughout the Mackenzie basin hydro canal system during the 2015–2016 sports fishing season. **Staff Involved:** Rhys Adams **Contact:** Rhys (radams@fishandgame.org.nz) for more details.

Managed Aquifer Recharge Monitoring –

Monitor effects of Managed Aquifer Recharge in the Lower Hinds Plains on flow, water quality and fish populations. **Staff Involved:** Mark Webb **Collaborators:** Hinds Drains Working Party, Environment Canterbury **Contact:** Mark (mwebb@csifgc.org.nz) for more details.

Central South Island Region 🧑=7

Lake Alexandrina Tagging & Diary Programme –

Trout population study of Lake Alexandrina and McGregor using mark recapture to monitor success of spawning enhancement in Outlet Creek. **Staff Involved:** Hamish Stevens **Collaborators:** Lake Alexandrina Conservation Trust **Contact:** Hamish (h.stevens@csifgc.org.nz) for more details.

Small Stream Habitat Creation, Hinds

Drains – Creation of small boulder weirs to create varying habitat. **Staff Involved:** Mark Webb **Collaborators:** Hinds Drains Working Party, Environment Canterbury **Contact:** Mark (mwebb@csifgc.org.nz) for more details.



(From left) Mark Webb, Jayde Couper and Rhys Adams electrofishing Boundary Drain.

Photo © Central South Island Fish & Game

Otago Region

👤=9

Minimum Flows & Deemed Permit Transfers

– A range of fisheries and habitat assessments are ongoing to support submissions on environmental flows for streams and rivers across the Otago Region. See otago.fishandgame.org.nz/content/habitat-protection-management for more details.

Staff Involved: all.

Lake Hayes & Lake Johnson Food Web Study

– Investigation of trophic interactions and algal blooms in these two eutrophic lakes. **Staff Involved:** Helen Trotter
Collaborators: Clutha Fisheries Trust & University of Otago
Contact: Helen (h.trotter@fish-game.org.nz) for more details.

Backcountry Fisheries Monitoring – Population and user surveys are underway to improve understanding of increasing angling pressure from both tourists and locals on these sensitive fisheries. **Staff Involved:** Paul van Klink

Takitakitoa Wetland Restoration – A 350 m bund was constructed to raise the water level, restoring this drained wetland and creating 32 ha of enhanced habitat for wetland flora and fauna. **Staff Involved:** Ian Hadland
Collaborators: NZ Gamebird Habitat Trust

Students checking out their salmon ova as part of Southland's Fish in Schools Programme.

Photo © Bill Jarvie



Southland Region

👤=7

Otapiri Stream Benthic Invertebrate Survey

– This study compared the historical (1960s) Otapiri Stream benthic invertebrate community with the current invertebrate community. Changes in invertebrate community were linked to land use changes. **Staff Involved:** Cohen Stewart
Collaborators: Cawthron Institute **Contact:** Cohen (cohen.stewart@southlandfishgame.co.nz) for more details.

Fiordland Didymo Monitoring & Awareness

– Southland Fish and Game have continued their collaboration with MPI to monitor didymo in Fiordland and educate recreational users on how they can prevent the spread of aquatic pests. **Staff Involved:** Bill Jarvie & Hamish Angus **Collaborators:** MPI **Contact:** Bill (bill.jarvie@southlandfishgame.co.nz) for more details.

Wetland Habitat Creation – Southland Fish and Game continue to offer landowners wetland design advice and subsidies for wetland creation. **Staff Involved:** Erin Garrick & Zane Moss **Contact:** Erin (erin.garrick@southlandfishgame.co.nz) for more details.

Fish in Schools – The newly established Fish in Schools programme has seen four Southland classes raise salmon from eggs to fry in the classroom. This programme has provided an ideal platform to educate students about the importance of water quality. **Staff Involved:** Cohen Stewart & Erin Garrick
Collaborators: North Canterbury Fish and Game **Contact:** Cohen (cohen.stewart@southlandfishgame.co.nz) or Erin (erin.garrick@southlandfishgame.co.nz) for more details.

Takitakitoa Wetland restoration bund construction.

Photo © Ian Hadland



Takitakitoa Wetland restoration planting day (Otago) .



COUNCILS & UNITARY AUTHORITIES

Christchurch City Council



👤=1

Dr Belinda Margetts headed off on maternity leave in October – **Dr Greg Burrell** from Instream Consulting Ltd will cover the role until she returns in Nov 2017.

Kā Pūtahi (Kaputone) Creek Realignment, Restoration & Monitoring – Realignment of waterway to prevent two large culverts due to motorway, incorporation of detailed instream habitat features and baseline monitoring to determine ecological improvements over time. **Staff Involved:** Dr Belinda Margetts & other internal staff **Collaborators:** GSL Ltd (contractor), Dr Tanya Blakely (Boffa Miskell; baseline monitoring) & NZTA **Outputs:** www.ccc.govt.nz/assets/Documents/Environment/Water/Monitoring-Reports/Ka-Putahi-Kaputone-Creek-Realignment-Baseline-Survey-PDF-2.7-MB.PDF

State of Environment Monitoring – Spatial and temporal analyses of water quality, instream sediment and aquatic ecology data across the city. **Staff Involved:** Dr Belinda Margetts **Collaborators:** various consultants **Outputs:** www.ccc.govt.nz/environment/water/waterways/monitoring

Instream Spring Water Quality Research – Identification of nitrogen and phosphorus entering waterways through contaminated springs, contributing to high levels in stream water. **Staff Involved:** Dr Belinda Margetts **Collaborators:** Peter Callander, PDP **Outputs:** www.ccc.govt.nz/assets/Uploads/Water-quality-of-instream-springs-in-Waimairi-and-Wairarapa-Streams-2015-PDF-10.6-MB.pdf

Global Consent Applications to Regional Council & Review of Waterway Setback Rules in District Plan – Consent applications for stormwater and wastewater, involving effects assessment and development of detailed monitoring programmes, development of more robust rules for building and carrying out earthworks in waterway setbacks. **Staff Involved:** Dr Belinda Margetts & other internal staff.

Kā Pūtahi (Kaputone) Creek before (top) and after (bottom) realignment and enhancement, August 2016.

Photos © Fiona Greig, Christchurch City Council





Fish refuges incorporated into a number of restoration projects, which will be further enhanced by the planting of overhanging and shading vegetation, and higher water levels once full flow is redirected.

Photos © Dr Belinda Margetts, Christchurch City Council

Sandy Haidekker has been working with Fleur Matheson (NIWA) to develop a robust and rapid macrophyte assessment protocol that enables (1) future development of a regional attribute table (corresponding to NOF) and (2) analysis of relationships to other measures of ecosystem health such as macroinvertebrate metrics and dissolved oxygen thresholds. A maximum assessment time of 15 minutes assures that it can be integrated in State of the Environment (SOE) monitoring. Since 2014 macrophytes were recorded whenever present at SOE sites (which is all-year round in some streams given the sunny and warm Hawke's Bay climate!). For a start, the assessed data will help inform the stakeholder group involved in the TANK Plan Change (**Tutaekuri, Ahuriri, Ngaruroro and Karamu** catchments), and support the decision making about appropriate freshwater objectives to improve ecosystem health in the lowland streams in the Heretaunga Plains.

Lowland Streams

Experimental Shading Trials – Shading trials with shade sails and plants to trial reduction in macrophyte growth in streams. Potential management alternative to spraying/digging. Andy Hicks, Sandy Haidekker and Thomas Wilding continue the shading trials in macrophyte dominated drains. The first year's focus was on providing shade to reduce macrophyte growth (with the long term aim to minimise spraying and digging out the drains), still maintaining flood conveyance, and getting cost-effective and successful planting schemes and maintenance. The data showed a clear difference in the full shade (a shade sail to simulate full canopy closure), partial shade, shade on the north side only and no shade at all. We struggled with the survival of plants in a very dry summer, spray drift, floating duckweed building up at downstream sites, and most recently – stolen shade sails! We will be focusing on identifying cheap but still effective approaches for establishing shade. These next trials involve a variety of native plants, weed mats to reduce maintenance required, using cheaper tubestock rather than PB3s, wider spacing of plants to reduce plant costs, and using *Miscanthus* as a nursery crop. **Staff Involved:** Andy Hicks & Sandy Haidekker **Outputs:** trial in progress.

Ecosystem Health – Investigation on stressors on ecosystem health in macrophyte dominated lowland streams report. **Staff Involved:** Sandy Haidekker **Outputs:** Report completed; link on HBRC website.

Fish

Fish Ramp Trial – Experiment looking at using floating fish ramps to overcome fish barriers in small streams. Trialling different ramp surfaces against an array of fish species with the aim to develop a rotomoulded product that can be distributed nationwide. Daniel Fake has been experimenting with different surfaces on floating ramps to improve fish passage in small streams. The experiments are to be used as part of his Master's project, but also to support the production of a working rotomoulded ramp that can be distributed nationwide. The ramps are showing promise with good numbers of inanga and redfin bullies able to surmount them at a 15° angle. To date, nine territorial authorities have confirmed interest in purchasing the ramps, which are due to be ready before the end of 2016. **Staff Involved:** Daniel Fake

ICOLL

Whakaki Monitoring – Characterisation of water quality within the ICOLL. Including citizen monitoring, and consultation with the local community. **Staff Involved:** Gary Rushworth

Hydrology

Flow & DO – Low gradient streams require more flow to achieve the same oxygen levels. Flow drives oxygen supply to the fish. Temperature drives oxygen demand by the fish. Effects are expected when supply falls short of demand. **Staff Involved:** Thomas Wilding **Outputs:** report completed

Rain hail or shine – ramp experiments must go on!



A motion-sensor trail camera snaps a photo of the potential shade-sail thief. Police have not followed up this lead.



Assessments in macrophyte dominated lowland streams.



Hydrology

5

New: Craig Pickford, Regan Diggelman, Jackson Espin /
Left: Andrew Cotter, Shane Sullivan

Continuous Water Quality Monitoring Projects (e.g. Dissolved Oxygen Monitoring & Multiparameter SONDES) – Setting up the new continuous DO equipment at two sites along the Patea River (one permanent site and one portable site) and as well as the multi-parameter SONDES in Mangati Stream, an industrial catchment in New Plymouth. **Staff Involved:** Craig Pickford, Fiona Jansma & Warrick Johnson

Te Wai Kaiora Project – A collaboration with the Ngaa Rauru Iwi to develop and implement a waterway health monitoring programme that encompasses cultural and scientific indicators for the Waitotara and Whenuakura rivers. **Staff Involved:** Sam Tamarapa (Iwi Liaison officer), Kevin Archer (Education Officer) & Katie Blakemore.
Collaborators: Ngaa Rauru iwi

Physical/Chemistry

9

New: David Olson (maternity cover for Rachel McDonnell)

Biology

11

New: Brooke Thomas (returned from maternity leave)

SEM Macro-invertebrate Monitoring – Biannual macroinvertebrate monitoring at 59 sites. Two new sites were added in 2015–2016 (both are located in the eastern hill country catchment). **Staff Involved:** Bart Jansma, Darin Sutherland & Katie Blakemore **Outputs:** www.trc.govt.nz/council/plans-and-reports/environmental/environmental-monitoring-technical-reports

Macro-invertebrate Recolonisation Project – TRC provided long term data to assist NIWA's project on stream connectivity and macro-invertebrate recolonisation in Taranaki with regard to riparian planting initiatives in the region. **Staff Involved:** Fiza Hafiz, Shaun Cleland & Chris Lambert (GIS department) **Collaborators:** NIWA (Dr Richard Storey)

SEM Riparian Management Water Quality Monitoring – A comprehensive report is underway to analyse and document the long term water quality and riparian vegetation data collected at four targeted catchments in the Taranaki Region. **Staff Involved:** Bart Jansma, James Kitto, Darin Sutherland, Fiza Hafiz & Land Management Officers (LMO)

SEM Physicochemical Monitoring – Two new sites were added to this programme in 2015–2016 (located in the eastern hill country catchments). **Staff Involved:** David Olson, Fiza Hafiz, James Kitto, Katie Blakemore, Ray Harris & Rae West **Outputs:** www.trc.govt.nz/council/plans-and-reports/environmental/environmental-monitoring-technical-reports

SEM Continuous Dissolved Oxygen Monitoring – Two new sites were established in Patea River (a permanent and a portable site) for continuous DO monitoring. **Staff Involved:** James Kitto, John Williams & Craig Pickford

Catchment Monitoring – A continuous multi-parameter sonde is scheduled to be installed in the Mangati Stream, one of the industrial catchment in New Plymouth for the 2016/2017 monitoring year. The data will be used as part of consent compliance monitoring as well as water quality monitoring. **Staff Involved:** Scott Cowperthwaite

Biodiversity

6

SEM Freshwater Fish Monitoring Programme – As part of the SEM fish monitoring, brown mudfish monitoring will target six sites around the Taranaki region. Two sites were surveyed in September and a total of 64 adult and 38 juvenile mudfish caught. **Staff Involved:** Bart Jansma & Dean Caskey

SEM Wetland Monitoring Programme –

The biodiversity team conducted 13 wetland assessments, including two swamp forests, in Taranaki last year. Assessments included hydrological integrity, native plant dominance, ecosystem connectivity and predator impacts. Just over half (54%) showed improvement in overall condition compared to the previous 2010 assessments. **Staff Involved:** Halema Jamieson, Dean Caskey, Toby Shanley, Brennan Mahoney & Sean Gardiner

Scientific officer, Bart Jansma
at one of the monitoring
sites for SEM fish monitoring
programme in South Taranaki.

Photo © Dean Caskey



Adult and juvenile mudfish caught
during the brown mudfish monitoring
programme this year.

Photo © Dean Caskey



Scientist and planning staff have been heavily involved in a collaborative governance process for the Takaka Freshwater Management Unit (FMU). This has been going on for 2½ years and now our planners are working on a draft plan change which will hopefully be put back to the group by December 2016. Due to limited staff numbers the same process has been put on hold for the Waimea FMU. More info on some of our other key projects over the past year, below.

Freshwater

👤=2

New: Jon McCallum

Extensive Review of Tasman DC's River Water Quality Monitoring Programme – In July 2016, after 15 years of quarterly monitoring, sampling is now undertaken monthly. All parameters tested at all sites. Number of sites reduced from 60 to 29. This has resulted in extra costs of 66% for staff time and 155% in lab costs. **Staff Involved:** Trevor James & Jon McCallum **Collaborators:** Roger Young, Cawthron Institute **Outputs:** see www.envirolink.govt.nz

Production of Movie about River Health in Tasman – The first movie about the values and state of Tasman's rivers was released in August 2016. It also shows the community taking action and tries to inspire others to join in the action. **Staff Involved:** Trevor James & Claire Webster **Collaborators:** Maggie Atkinson, Maze Filmmakers **Outputs:** www.tasman.govt.nz/environment/water/rivers/our-waters-in-common

Wetlands

👤=2

Wetland Mapping in Tasman – Letters with draft wetland maps have been sent out to all wetland owners in Tasman's part of the Buller catchment and Golden Bay. Follow-up site visits have been completed for over 60% of wetland owners in the Buller and a good start has been made on visits to Golden Bay wetlands. **Staff Involved:** Trevor James & Jeroen Lurling **Collaborators:** Bev Clarkson, Landcare Research

Water

👤=8

New: Eloise Brown, Sung Soo Koh.

Otolith Microchemistry to Determine Recruitment Sources of Native Fish Species in Lower Waikato Basin – **Staff Involved:** Bruno

David, Josh Smith & Deniz Ozkundakci **Collaborators:** Otago University **Contact:** Bruno David for more details.

Ecological Condition of Waikato Wadeable Streams Based on the Regional Ecological Monitoring of Streams (REMS) Programme 2012–2014 Report – **Staff Involved:** Michael

Pingram & Mark Hamer **Collaborators:** Kevin Collier (UoW) **Contact:** Michael Pingram for more details. **Outputs:** www.waikatoregion.govt.nz/tr201446

Non-wadeable River Ecological Indicators Trial and Development – **Staff Involved:** Michael

Pingram & Mark Hamer **Collaborators:** Joanne Clapcott (Cawthron Institute). **Contact:** Michael Pingram for more details. **Outputs:** see www.waikatoregion.govt.nz/tr201446

Regional Hazards & Environmental Compliance

👤=3

New: Peter Roberts

Monitoring Effects & Compliance of Instream Works & Scheme Infrastructure

– Including effects monitoring, development of best practice, and restoration for offset/compensation. **Staff Involved:** Mike Lake **Collaborated with:** others within ICM **Contact:** Mike Lake for more details.

Natural Heritage

👤=10

New: Paula Reeves / **Left:** Tracie Dean-Spiers

Lakes – Data deficient lakes programme development.

Staff Involved: Paula Reeves & Deniz Ozkundakci **Contact:** Paula Reeves for more details.

Water Quality, Coast & Ecology

👤=8

New: Josh Smith, Alicia Catlin / **Left:** Stephen Scothern, Ian Buchannan

Helped with the above projects, as well as undertaking:

SOE Water Quality Monitoring

SOE Invertebrate Monitoring

SOE Fisheries Monitoring

SOE Estuary Monitoring

Sediment Monitoring

Staff Involved: Josh Smith, Alicia Catlin, Asaeli Tulagi, Chris McKinnon, Nathan Singleton, Dayna Calkin & Claire Kotze

Contact: Mark Hamer for more details.

Fisheries

Recent completion of the first assessment of WRC's SOE fisheries programme (technical report available on WRC public webpage). Internal and technical reports completed for the Carp N neutral project including results comparing performance of using invasive fish fertiliser pellets vs artificial fertiliser tablets in dune restoration and use of invasive fish as a lure in a terrestrial pest trapping programme. Preliminary results of otolith microchem work reveal surprisingly high levels of non-diadromous recruitment for supporting large galaxiids in the lower Waikato basin (above the major riverine lakes). Information likely to be used to help guide WRA funded river rehab initiatives for lower Waikato native fisheries projects.



Ecosystems & Quality

👤=8

New: Megan Oliver (Team Leader) / **Left:** Juliet Milne, Brett Cockeram, Summer Greenfield

Benthic Cyanobacteria in Rivers in the Wellington Region – Technical Report –

Completion of a technical and summary reports on the last decade of monitoring and research of benthic cyanobacteria blooms in the Wellington region. **Staff Involved:** Mark Heath, Summer Greenfield & Juliet Milne **Collaborators:** Cawthron (Susie Wood), GNS (Uwe Morgenstern, Chris Daughney & Troy Baisden), River Lake Ltd (Keith Hamill) & VUW (Ken Ryan) **Outputs:** Technical report: www.gw.govt.nz/assets/council-publications/REPORT-Benthic-cyanobacteria-blooms-in-rivers-in-the-Wellington-Region-A-decade-of-monitoring-and-research.pdf. Summary report: www.gw.govt.nz/assets/Our-Environment/Environmental-monitoring/Environmental-Reporting/Technical-publications/f-WRC18157-Toxic-Algae-5-LR-web.pdf

New SoE River Monitoring Programme – Utilising Probabilistic Network Design

– Implementation of an ecologically focused monitoring programme that is based on a network of randomly selected sites. Each site is surveyed for fish, invertebrates, macrophytes and periphyton. This new programme compliments on-going programmes focused on water quality monitoring. **Staff Involved:** Alton Perrie, Summer Greenfield & Mark Heath

Can Periphyton Biomass be Estimated from Periphyton Cover? Monitoring Trial –

A study to assess whether periphyton chlorophyll *a* can be accurately estimated from periphyton cover assessments. The study involved monthly paired cover/chlorophyll *a* measurements at 13 river sites. Periphyton conversion factors developed for Canterbury Rivers were tested. **Staff Involved:** Summer Greenfield & Mark Heath **Collaborators:** NIWA (Cathy Kilroy) **Outputs:** Report to be completed in November 2016.

Science Strategy & Information

👤=8

New: Brett Cockeram, Lucy Baker (team leader) / **Left:** Lian Butcher (now Department Manager)

Ruamāhanga & Te Awarua-o-Porirua Whaitua Collaborative Modelling Projects

– Delivery of modelled information to whaitua committees, to help inform decisions on priorities for land and water management. **Staff Involved:** Natasha Tomic, Brent King & Sheryl Miller **Collaborators:** Numerous! Including Aqualinc, Land-Water-People, NIWA, Cawthron, Jacobs, GNS, AgResearch, Landcare, iwi.

RESEARCH & CONSULTANCY COMPANIES

Aquanet Consulting Ltd



👤=3.5 / **New:** Yen Dinh (Massey PhD student) / **Left:** Siobhan Lynch

Ruapehu

Consenting of Key Infrastructure (Wastewater & Water Treatment Plants) for Ruapehu District Councils

– Project management for the re-consenting of the Ohakune, Raetihi, National Park and Whakapapa WWTPs and Raetihi, Owango and Taumarunui community water supplies. Water quality, periphyton and macroinvertebrate monitoring. Project management, field studies, technical reports. Aquanet Consulting, along with Environmental Management Services and Ruapehu District Council, were awarded the RMA Law Association Top Project Award for 2016 *‘for developing an approach in the re-consenting of the Ohakune, Raetihi and National Park Wastewater Treatment Plants that was culturally inclusive, collaborative, technically feasible and effective’*.

Staff Involved: Olivier Ausseil, Amy Feck & Fiona Death

Collaborators: Ruapehu District Council, Ngāti Rangī, Uenuku Veolia, DOC & Environmental Management Services

Curious Minds – The goal of this project is to engage primary and secondary school students from Ruapehu district in investigative field research with experts in environmental sciences, engineering, policy and education using a case-study of high relevance to rural communities. It aims to get high school students to help determine why phosphorus is removed so efficiently from the National Park treatment wetland as this knowledge may provide a foundation for engineering novel solutions for rural communities in need of low-cost treatment processes, and also involves getting primary school students involved in field activities to learn more about the water quality of their local rivers and streams. Aquanet, along with Professor Benoit Guieysse (Massey University), were successful in gaining funding for work with the students through MBIE’s Curious Minds projects. **Staff Involved:** Olivier Ausseil, Amy Feck & Fiona Death **Collaborators:** Massey University School of Engineering and Advanced technology, Ruapehu College, National Park Primary School & Ruapehu District Council

Ruapehu/Manawatu

Nutrient Diffusing Substrates (NDS)

Study – The aim of this project is to develop and validate a methodology allowing the use of ammoniacal nitrogen in NDS-type bioassays, and field-test the method in the Makotuku River upstream and downstream of the Raetihi WWTP discharge. It was conducted by Massey University School of Engineering and Advanced technology and Aquanet Consulting, with the support of Ruapehu District Council, Horizons Regional Council, and Manawatu District Council.

Staff Involved: Olivier Ausseil, Amy Feck & Fiona Death

Collaborators: Massey University School of Engineering and Advanced Technology & Ruapehu District Council

Rangitikei & Manawatu

Consent & Compliance Processes for Key Infrastructure (Wastewater & Water Treatment Plants) for Rangitikei & Manawatu District Councils

– Project management, field studies, technical reports, compliance reports, peer review and involvement for the WWTPs at Bulls, Hunterville, Taihape, Marton, Halcombe, Cheltenham, Kimbolton, Rongotea in relation to wastewater discharges at these sites. Fiona and Amy are continuing ongoing monthly monitoring of periphyton and macroinvertebrate communities in the Porewa Stream for Hunterville and Hautapu River for Taihape WWTP’s. **Staff Involved:** Olivier Ausseil, Amy Feck & Fiona Death **Collaborators:** Rangitikei District Council, Manawatu District Council, Environmental Management Services & HydroNet

Sampling on an unnamed tributary of the Wairere Stream
upstream of the Whakapapa WWTP, Ruapehu.

Photo © Aquanet Consulting, October 2015



Macroinvertebrate sampling on the Whanganui River at
Matapuna for the Taumarunui water take.

Photo © Aquanet Consulting, March 2016

Biosortid Ltd



Chris Fowles established Biosortid Ltd in 2006 primarily to provide macroinvertebrate sample processing services for consent monitoring and state of the environment programmes, particularly in relation to MCI reporting. To date the company has processed approximately 4,000 samples and has assisted with field work for clients.

Boffa Miskell Ltd

 = 29 ecologists



We've had a number of new ecologists join our team, including recent freshwater ecology graduates **Katie Noakes**, joining the Christchurch-based team, and **Jeremy Garrett-Walker** in Wellington.

Katie recently completed her MSc from the University of Waikato in groundwater ecology. Jeremy's MSc, also from the University of Waikato, looked at ecosystem health in constructed ponds and wetlands.

Dr Jacqui Bell, aquatic ecologist, recently started in the Hamilton office.

Our team has been involved in all sorts of interesting and exciting projects and science outreach programmes, as well as continuing research on ecotoxicity in estuarine macroinvertebrates, urban stream restoration, aquatic insect dispersal, and chironomids.

Here's a taste of what we've been up to:

Surveys & State of the Environment Monitoring for Councils Around the Country – Conducting surveying and regular monitoring and SORE monitoring for Councils around the country; reassessment of the Christchurch River Environment Assessment Survey (CREAS).

Stream Rehabilitation, Restoration, & Naturalisation – Design and ecological advice for stream daylighting and naturalisation projects; Land Drainage Recovery Programme; baseline surveying for stream restoration projects.

Management Plans – For weed management (Rotorua Lakes), land development projects, mudfish, and catchment restoration plans.

Ecological Advice for Small to Large Residential, Commercial, Road, & other Infrastructure Projects – Assorted types of advice from full technical assessments, advice on fish passage and habitat creation, mitigation measures for developments, fish salvage and relocation works.

Native Fish Salvage & Relocation Programmes – An assortment of fish salvage programmes, including Ruakura in Waikato, Western Belfast Bypass in Christchurch, Transmisson Gully in Wellington, Hairini Link in Tauranga.

Staff involved (across all projects listed above):
Tanya Blakely, Katie Noakes, Craig Pauling, Ian Boothroyd, Eddie Sides, Daniel Ahern, Jacqui Bell, Sharon De Luca, Louise Saunders, Kieran Miller, Vaughan Keesing, Leigh Bull, Karin Seivwright, Kathrine de Silva, Tessa Roberts, Tony Payne, Jeremy Garrett-Walker & Stella McQueen



Holding tanks used for the Horokiri Stream fish out.

Photo © Boffa Miskell, 2016



Boffa Miskell celebrates the opening of Kā Pūtahi Creek (Kaputone Creek) diversion, by releasing inaka (inanga) and tuna (longfin eels) with children from Tuahiwi School.

Photo © Christchurch City Council, 2016

The Catalyst Group

7 / **New:** Peter Taylor (Practice Leader – Catchment Management)

Fleur Maseyk secured her PhD from the University of Queensland, titled 'Applying ecosystem services thinking to natural resource management and conservation decision making'.

Water Quality, Biodiversity, Policy, Resource Management, Catchment Management & Iwi Values

Ngaruroro Water Conservation Order

Application – Application lodged, and discussions underway with concerned parties. **Staff Involved:** Alistair Beveridge & Greg Carlyon **Collaborators:** Ngāti Hori, Fish & Game, Forest & Bird, Whitewater NZ & Jetboating NZ

Outstanding Freshwater Bodies – Interpreting NPS-FM outstanding waterbodies provisions. **Staff Involved:** Alistair Beveridge & Greg Carlyon **Collaborators:** HBRC, Auckland Council & MfE

Iwi and Hapū Values for the Ngaruroro River – Technical lead on the interpretation of Māori issues, values, and attributes for the Ngaruroro River. **Staff Involved:** Kate McArthur, Laura Jessen, Maree Gurney **Collaborators:** Morry Black – Mauri Protection Agency, Ngāti Kahungunu Iwi Incorporated, Te Taiwhenua o Heretaunga, TANK Mana Whenua rōpū & HBRC

Freshwater chapter of Nelson Plan – Strategic lead on the interpretation of water quality data, and preparation of issues, values, and attributes and limits papers. **Staff Involved:** Kate McArthur, Alistair Beveridge **Collaborators:** Nelson City Council, Te iwi o Te Tau Ihu o Te Waka-a-Māui & Cawthron Institute

One Plan – Assisting with declaration against Horizons Regional Council's implementation of the One Plan. **Staff Involved:** Greg Carlyon, Peter Taylor, Kate McArthur **Collaborators:** Fish & Game & Environmental Defence Society

In addition to the projects listed, which have been done for various clients, The Catalyst Group has raised concerns in the Manawatu-Whanganui region regarding the operation of winter feed-lots alongside the Rangitikei River, and the negative environmental impacts this practice is having.

The Catalyst Group have produced an analysis of the One Plan's policies and rules which demonstrate it provides Horizons Regional Council with the necessary tools to control this practice. **Contact:** Alistair Beveridge for further information if you're interested in their analysis.



Images of feed-lots taken during a flight funded by The Catalyst Group. Many feedlots were identified, but these two were singled-out because: (1) they are located high in the Rangitikei catchment (Springvale – on the Napier-Taihape highway), and (2) located alongside Hunterville's water supply intake (Grace Vinegar Hill).



Grace Vinegar Hill



Springvale – on the Napier-Taihape highway

Sean Waters joins the Cawthron freshwater team after successfully completing his PhD at Lincoln University researching biogeochemistry in Te Roto o Wairewa. He started in March but promptly headed off to the Arctic Ocean to sail from Svalbard to Iceland. After a few weeks in Iceland looking for the best mountain biking he's now back in Nelson working with Dave Kelly and Susie Wood on a number of lake and reservoir projects. **Dr Charlotte Šunde** also joined the team to work on the Sustainable Seas national science challenge, but brings great expertise on values and valuation frameworks to the people, policy and planning side of the freshwater team. During 2016, **Roger Young** has enjoyed working with the collaborative Takaka Freshwater Land Advisory group on freshwater allocation approaches and limit setting. **John Hayes** spent some time in the media spot light with his research on fish needing more water than we thought. This new knowledge has global implications for irrigation and hydro-electric development, and recreational fishing and may result in a need to revise minimum flows upward and

water allocation limits downward. **Joanne Clapcott** and **Annika Wagenhoff** have been working on NOF attribute development, specifically sediment and macroinvertebrates. And whilst in Germany, Annika Wagenhoff gave invited seminars (at the IGB in Berlin and the Senckenberg Institute in Gelnhausen) presenting her research on ecological thresholds. **Kati Doebling** is helping out the team where needed, but in particular with LAWA-related work, while based in Fiji. **Rob Holmes** has been kicking goals with habitat restoration for fish, and **Karen Shearer** has been saving goals with bronze medals in national and international hockey masters competitions.



Algal Bloom on Te Roto o Wairewa/Lake Forsyth.

Photo © Sean Waters

Freshwater Ecology

👤=11

New: Sean Waters

MBIE Programme ‘Management of Cumulative Effects of Stressors on Aquatic Ecosystems’ – Research on multiple-stressor effects and ecological thresholds in stream ecosystems with management implications. Providing scientific knowledge to support limit setting as required by the NPS-FM or freshwater management in the wider sense. **Staff Involved:** Annika Wagenhoff, Joanne Clapcott, Rasmus Gabrielsson, Susie Wood, Roger Young, Rob Holmes, John Hayes, Karen Shearer & Eric Goodwin **Collaborators:** Antonia Liess (Halmstad University), Ada Pastor (Catalan Institute for Water Research), Kelvin Lau, Gillian Lewis, Christoph Matthaei, Jay Piggott & Colin Townsend **Outputs:** see publications list

MBIE Programme ‘Aquatic Rehabilitation’ – Research into reference benchmarks including modelling reference MCI and temporal variation in native fish populations; as well as the importance of habitat restoration for supporting fish values, and instream effects of improved sewage treatment. Providing knowledge of benchmark expectations to inform restoration targets and resource allocation. **Staff Involved:** Robin Holmes, Joanne Clapcott, Roger Young, Eric Goodwin, Kati Doehring, Karen Shearer & John Hayes **Collaborators:** Martin Neale, Summer Greenfield, Kevin Collier, Ton Snelder, John Quinn, Craig Depree & Bob Wilcock **Outputs:** see publications list

Surface Water Allocation Programme – Relationship between invertebrate drift concentration and flow. Developed a trout drift Net Rate of Energy Intake model which shows that a WUA model substantially underestimates the flow requirements of drift feeding fish. The NREI model helps inform ecosystem flow requirements for water plan reviews. **Staff Involved:** John Hayes, Joe Hay, Eric Goodwin & Karen Shearer **Collaborators:** Murray Hicks (NIWA) & Lon Kelly (Alaska) **Outputs:** see publications list

Algae & Cyanobacteria – Identifying drivers of *Phormidium* blooms through analysis of regional, national and experimental data to identify river susceptibility and drivers of bloom formation and ecosystem effects. Field based experiments aimed at understanding and measuring toxin production in bloom forming cyanobacteria. See <https://vimeo.com/cyanoresearch> and <https://vimeo.com/163888507> for more on the project. **Staff Involved:** Susie Wood, Jonathan Puddick, Javier Atalah, Roger Young, Kati Doehring, Annika Wagenhoff, Hugo Borges & Andy Selwood **Collaborators:** Ian Hawes, Tara McAllister (University of Canterbury); Ken Ryan, Laura Kelly, Emily Martin, Andrew Rees (Victoria University); and David Hamilton & Vanessa Cotterill (Waikato University) **Outputs:** see publications list

People, policy & planning

👤=5

New: Charlotte Šunde

Community Perceptions of Collaborative Freshwater Planning Processes – The project compared community perceptions of their local collaborative freshwater planning processes in Hawke’s Bay, Northland, and Waikato. It involved online surveys of people in both collaborative and non-collaborative areas of the three regions to enable comparison. **Staff Involved:** Jim Sinner & Mark Newton **Collaborators:** Pike Brown (Landcare Research) **Outputs:** see publications list

Science & Collaborative Processes – This project looked at the changing roles for science and scientists in collaborative freshwater planning processes. It involved interviews with scientists, project managers, facilitators, and others involved with collaborative freshwater planning processes. **Staff Involved:** Natasha Berkett & Mark Newton **Collaborators:** Andrew Fenemor (Landcare Research)

GWRC Whaitua for Ruamahanga & Porirua – Oversight of social science and economics to inform NPS implementation. **Staff Involved:** Jim Sinner & Chris Batstone **Collaborators:** Ned Norton (LWP), Mal Green (Streamlined), Jonathon Moores & Jenni Gadd (NIWA), and Hohepa Potini.

MDC Murphys Creek – Collaborative process to address freshwater management in a small urban catchment, as the Greenfield and Brownfield development in Blenheim necessitates collaborative solutions for stormwater management. **Staff Involved:** Mark Newton, Natasha Berkett & Annika Wagenhoff



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North Island – Estuary/Coast

Eastern Bays Seawall Repairs AEE –

Assessment of ecological effects on the intertidal marine environment/vascular plants/birds, from upgrading seawalls in the Eastern Bays area. **Staff Involved:** Shelley McMurtrie, Nick Hempston, Kirsty Brennan & Alex James **Collaborators:** Sustainability Solutions **Outputs:** AEE report

North Island – Freshwater

Lambton Harbour ICMP Ecological Assessment –

Assessment of ecological and amenity values of remnant open channels to support ICMP development. **Staff Involved:** Alex James, Kirsty Brennan & Shelley McMurtrie **Collaborators:** Wellington City Council **Outputs:** ecological assessment report, presentation

Palmerston North City Council Monitoring Programme Review –

Critical review of PNCC water and sediment quality monitoring programme to inform new monitoring scheme with Rangitāne. **Staff Involved:** Alex James, Kirsty Brennan & Shelley McMurtrie **Outputs:** review report

Resource Consent Reviews – Reviewing freshwater ecology components of various consent applications for GWRC. **Staff Involved:** Alex James **Outputs:** auditing memos

Processing SOE Samples for Regional Councils –

Processing freshwater macroinvertebrate samples for regional councils to contribute to SOE reporting. **Staff Involved:** Emily Demchick, Nick Hempston & Siobhan Culhane **Outputs:** Invertebrate data to be used for SOE reporting.

1. & 2. Kirsty, Nick & Fred Overmars conducting a broadscale habitat mapping survey along Wellington's Eastern Bays.
3. Siobhan, Nick & Emily processing samples in the lab.
- 4., 5. & 6. Nick, Emily & Shelley working on the Dudley Creek project which included engagement/education activities with the local community.

Photos © EOS Ecology

South Island – Estuary/Coast

Avon-Heathcote Estuary Benthic Ecology Monitoring –

Sampling the intertidal invertebrate community (epi/in-fauna) and physico-chemical characteristics of sites around the estuary and rivermouths as part of a long-term monitoring programme. **Staff Involved:** Nick Hempston, Emily Demchick **Outputs:** datasets

South Pegasus Bay Tuatua Monitoring –

Collecting tuatua and testing for bacteria and pathogens, to determine the efficacy of the ocean outfall sewage discharge. **Staff Involved:** Nick Hempston, Emily Demchick, Siobhan Culhane & Kirsty Brennan **Outputs:** datasets

South Island – Freshwater

Whaka Inaka : Causing Whitebait – Installing temporary spawning habitat (wheat straw bales) along Christchurch rivers to improve spawning success and provide evidence of where spawning habitat could be improved.

Included engaging with schools, local community, businesses, and iwi throughout the programme. 204 bales installed (at 34 sites) along 3 km of river in the Ōpāwaho/Heathcote River, Ōtakaro/Avon River (Lake Kate Sheppard) and Steamwharf Stream. Involved members of the local community, iwi and schools assisting during the four months of egg monitoring, as well as larger public days and group events. There are several links between this and other different environmental programmes (see the 'Engagement & Education' section).

Staff Involved: Shelley McMurtrie, Kirsty Brennan, Nick Hempston, Emily Demchick, Siobhan Culhane, Tom Adamson, Bronwyn Gay & Kim Hickford **Collaborators:** Te Rūnanga o Ngāi Tahu, University of Canterbury (MERG, Resilient Shorelines), K4 Cultural Landscapes & Department of Conservation (Mahaanui) **Outputs:** Facebook page (www.facebook.com/WhakaInaka), riverbank signage, media articles and TV interviews, presence at public events, overview report, multiple powerpoint presentations, maps and infographics, and ultimately long-term improvement in inanga spawning habitat in these rivers. See article on page 9 for more on this project.

Dudley Creek – EOS Ecology were the ecology lead for this project, providing design input to ensure flood mitigation also provided improved stream values. Included construction oversight, fish rescue work, and developing & implementing

engagement resources for a local preschool (healthy streams colouring-in pages, a fishing day, and invertebrate sampling day). See www.eoecology.co.nz/Our-Projects/Engagement.asp for more details. **Staff Involved:** Shelley McMurtrie, Nick Hempston, Emily Demchick, Siobhan Culhane, Alex James, Bronwyn Gay & Kim Hickford **Collaborators:** Beca, Opus & Downer **Outputs:** Ecology report, channel design drawings, posters for public engagement, and colouring-in pages & additional resources for preschool teaching aids.

Akaroa Stream Fish Kill – Investigating the cause of a fish kill in a stream, providing options for environmental compensation for use in the Restorative Justice process, and undertaking long-term monitoring to plot the recovery of the stream. **Staff Involved:** Shelley McMurtrie, Nick Hempston & Alex James **Collaborators:** Hill Laboratories **Outputs:** technical reports

Erosion Control Treatment Trials – Field experiments to test the efficiency of erosion control products in reducing loess runoff from exposed plots. **Staff Involved:** Tom Adamson & Shelley McMurtrie **Collaborators:** Environment Canterbury **Outputs:** Technical report, memo providing advice on updates to ESC guidelines, presentation. Outputs provide guidance for developer as well as regulatory authorities on the efficacy of these products.

South Island – Engagement & Education

Whitebait Connection (WBC) – National Inanga Spawning Education Programme Resources – Developing national education resources about inanga and inanga spawning, for use by Whitebait Connection coordinators for school and community engagement. **Staff Involved:** Bronwyn Gay & Shelley McMurtrie **Collaborators:** Mike Hickford (University of Canterbury (MERC)), Mountains to Sea Conservation Trust (Whitebait Connection) **Outputs:** Full education syllabus including powerpoint presentations, eight printable (and electronic) information resources and two signage resources, covering the story of inanga, how to find and restore spawning habitat, how to identify inanga, etc.

Whaka Īnaka Pest Monitoring Module for Schools – Developing and implementing a pest monitoring programme for local schools to undertake during the Whaka Īnaka programme. Sixteen local schools and 650 children involved in weekly pest monitoring along the riverbank. See www.facebook.com/WhakaInaka and www.eoecology.co.nz/Our-Projects/Engagement.asp for more information. **Staff Involved:** Kirsty Brennan, Shelley McMurtrie, Bronwyn Gay & Kim Hickford **Collaborators:** Te Rūnanga o Ngāi Tahu (Ian Gover), K4 Cultural Landscapes & University of Canterbury (MERC) **Outputs:** Online/phone/tablet app for entering data,

online interactive GIS map for results, infographic report cards identifying pest activity and dog poo along the river, and an action plan on what to do, presentations (by school groups) to local council organisations.

Environment Investigators Education Programme – Developing and implementing a programme under the Whitebait Connection framework that connects school students with inanga and inanga spawning in Christchurch. Providing classroom sessions, getting students in the field to assess habitat, and providing opportunities for action. Sixteen Christchurch schools, including 3 kindergartens, with 1500 kids involved. Some schools are getting a fish tank with inanga in. See www.eoecology.co.nz/Our-Projects/Engagement.asp for more info. **Staff Involved:** Kirsty Brennan, Shelley McMurtrie, Kim Hickford & Bronwyn Gay **Collaborators:** University of Canterbury (MERC) & K4 Cultural Landscapes **Outputs:** classroom resource package, media articles, fish tanks in schools, student-led action projects

Banks Peninsula Invertebrate Identification Chart – Developing, illustrating, designing and producing a local aquatic invertebrate ID chart for the Banks Peninsula that can be used by schools and community groups. See www.eoecology.co.nz/Our-Projects/Engagement.asp for more info. **Staff Involved:** Bronwyn Gay & Shelley McMurtrie **Outputs:** A0- and A3-size wall charts have been provided to the Banks Peninsula schools, Banks Peninsula Conservation Trust and Environment Canterbury, a downloadable pdf of the A3 size chart.



Shelley & Kirsty presenting the invert ID chart & 'Nature Agents' kits to Banks Peninsula Conservation Trust, Banks Peninsula Zone Committee and the Principal of Okains Bay School.

Top: WBC Coordinators Shelley & Kirsty at Lyttelton School & examples of the WBC educational resources.

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Riverscapes has had a busy year. Major projects have included:

Completion of Exotic Fish Removal Trials

– Key findings included that biomass suppression in the lagoon was possible using two net nights per year, and that perch were immigrating into the lagoon for the lake for congregational spawning. In response to this, Wairarapa Moana and Riverscapes have launched two new projects, both with the goal of potentially exploiting this behaviour. The first involves surveying for additional sites around the lake at which congregational spawning may occur, while the second involves investigating the potential for egg removal to be used to control perch populations.

Zealandia Perch Eradication – Further work on the Zealandia perch eradication project included completion of the Project Plan and draft Research Plan.

Koi Eradication – Riverscapes also project-managed a successful koi eradication (using rotenone) for DOC Whanganui.

Fish Surveys & Salvage – We have been doing a lot of fish surveying: in Carter's Reserve in Wairarapa for DOC, as well as Taupo Swamp in Plimmerton for QEII Trust, Boggy Pond in Wairarapa for Wairarapa Moana, and the Makoura Stream in Masterton for private clients. We also carried out a comprehensive fish salvage operation for GWRC in the eastern Wairarapa.

Smaller projects included weir inspections, macroinvertebrate surveying, AEE completion, and provision of field and technical support for the second annual GWRC community kākahi monitoring program.

Ryder turned 21 this year, with all three offices (Dunedin, Christchurch and Tauranga) getting together in Wellington for celebrations in July, and clients also being hosted at functions in Tauranga and Dunedin. We've also marked the occasion by making some changes to our logo and branding, and attendees at the NZFSS conference in Invercargill in December will be able to see this on their pens and notepads. Since 1995 the team has grown from just two to 18, with four new staff joining our Dunedin laboratory within the last 12 months. Four of our staff have been with the company for over 12 years, and of course Greg Ryder has been there right from the beginning (as I write he is enjoying a well-earned holiday in Europe). We'd like to thank all of the clients we have worked with over the years, from throughout the country. We're looking forward to continuing working with our existing and new clients for many years to come.

Hunter Downs Water Limited:

Pre-commissioning Monitoring – Designing and implementing baseline water quality and freshwater and riparian vegetation monitoring for the Hunter Downs irrigation scheme. **Staff Involved:** Ruth Goldsmith & Mark Sanders **Collaborators:** Irricon Resource Solutions Limited

Rangitata Diversion Race Management Limited: National Policy Statement for Freshwater Management Assessment –

Comparing existing water quality in RDRML command area against NPS-FM bottom lines. **Staff Involved:** Greg Ryder & Ruth Goldsmith

King Country Energy: National Policy Statement for Freshwater Management Monitoring – Water quality and periphyton monitoring at KCE power stations throughout the North Island. **Staff Involved:** Ben Ludgate & Ruth Goldsmith

Otago Regional Council: Water of Leith Flood Protection Scheme – Macroinvertebrate surveys pre- and post-construction of flood protection works throughout the Water of Leith. **Staff Involved:** Ben Ludgate & Jarred Arthur

Trustpower: Waverley Wind Farm Fish Surveys – Freshwater fish surveys at a proposed wind farm site in Taranaki, focussing on potential mudfish habitat. **Staff Involved:** Mark Sanders & Ruth Goldsmith



High definition digital photos can now be easily captured using a 'drone' (Unmanned Aerial Vehicle or UAV), greatly expanding our ability to record habitats in the field for inspection and analysis back at the office, such as this stream in south Otago.

Photo © Mark Sanders

Stark Environmental Ltd



John and Yvonne Stark established Stark Environmental Limited in June 2007 and have been offering specialist freshwater ecological research and consulting services (primarily concerned with macroinvertebrates, biotic indices, and biomonitoring) and undertaking macroinvertebrate sample processing for over nine years. SEL employs three part-time staff to assist with sample processing when the work load demands.

In the past year to date (despite John and Yvonne taking five weeks off in June–July to attend a nephew's wedding in England and to travel around England and Scotland) we have processed 730 macroinvertebrate samples for 17 different clients from throughout New Zealand and prepared 13 client reports. Most work has involved sample processing for State of the Environment and consent monitoring programmes for five Regional Councils, including the first ever SoE macroinvertebrates samples collected by Gisborne District Council.

Thomas Consultants



New staff: Sam Sutherland / **Left:** Sarah Budd

Thomas Consultants Ltd Ecology team have been offering ecological consulting services to Council and private clients for over 10 years. This has included being the primary consultant involved in delivering the award winning Project Twin Streams, overseeing and planning restoration for other Council Projects including Totara Creek Open Space development and Sustainable Catchments, numerous landowner stream restoration projects, expert ecological advice to developers in relation to wetland, bush and stream assessments and ecological review of multiple applications on behalf of Councils.

Anamata Stream Restoration Project – Rural Community stream restoration project. **Staff Involved:** Elizabeth Morrison & Samantha Sutherland **Collaborators:** CVNZ, Auckland Council **Outputs:** Landowner Restoration management plans and ongoing advice

Project Twin Streams Synthesis & Evaluation – Fieldwork, synthesis and evaluation of existing and new data to detect any trends or changes to stream health. **Staff Involved:** Melanie Dixon, Elizabeth Morrison, Shane Butland & Sarah Budd **Collaborators:** Brett Stansfield **Outputs:** Current State Report, Trends Report, Report Card

Totara Creek Open Space Development

– Started in 2010 and near completion involved planning and oversight of stream restoration activities for the open space network with the Northwest development. **Staff Involved:** Elizabeth Morrison, Melanie Dixon, Shane Butland & Wendy Smith **Collaborators:** Isthmus, Synergine & Auckland Council **Outputs:** Stream Ecological Valuations and ECR, Restoration Plans, Planting Plans, ongoing contract implementation management

Auckland Council Consent Ecology Reviews

– Provided ecology assessment on behalf of council for over 100 resource consent applications. **Staff Involved:** Melanie Dixon, Elizabeth Morrison, Michelle Tyrrell & Samantha Sutherland **Outputs:** Ecology Peer Review reports and condition recommendations.

Freshwater Ecology

National Environmental Standard – Plantation Forestry – Undertook a review of fish spawning, indeterminate taxa and GIS fish distribution model for MPI in response to submissions on the draft NES – Plantation Forestry. The assessment reviewed spawning for the 21 fish taxa included in the NES and additional indeterminate taxa that were not included in the draft NES. We conducted testing of the MPI fish distribution GIS layer and recommended changes and improvements to the layer to more accurately reflect fish distributions and location of spawning habitat. **Collaborators:** Stuart Miller (MPI) & Shannon Crow (NIWA) **Outputs:** MPI report: National Environmental Standard – Plantation Forestry. Additional Fisheries Advice.

Transmission Gully Highway – Independent reviewer. Currently undertaking reviews of aquatic ecological assessments, fish passage provisions, fish translocation operations and stream diversions designs on behalf of all parties involved in the construction and consenting of the highway project. **Staff Involved:** Richard Allibone **Collaborators:** Boffa Miskell, Greater Wellington Regional Council & CPB Heb Joint Venture.

RMA Decision Making

Otago Regional Council Plan Change 5A Lindis: Integrated Water Management – Independent Commissioner for the ORC Plan Change for the Lindis catchment integrated water management hearing. This plan change set a minimum flow and allocation limits for the Lindis River, and allocation limits for aquifers in

the area. **Staff Involved:** Richard Allibone **Collaborators:** Commissioners Gretchen Robertson and Clive Geddes **Outputs:** Recommendations of the Hearing Committee to Council, and RMA Section 32AA Further Evaluation.

Fisheries

Elver Trap & Transfer Monitoring – Elver surveys and monitoring of trap and transfer projects at three power schemes: Lake Coleridge, Waihopai and Branch River HEPS in Marlborough.

Numerous other projects have been undertaken in the South Island in what has been a busy first full year of operations for **Richard Allibone** of Water Ways Consulting. After establishing Water Ways in late 2014, an initial establishment phase has been left well behind and a variety of projects have been undertaken in the last 12 months. Additional projects include fisheries surveys, technical advice on resource consent applications and conservation concessions, providing expert technical advice and input to Environment Court mediations, AEEs for gold and coal mining operations, technical reviews of consent monitoring reports as a member of the Patea Dam expert panel reviewing monitoring outputs, and fish spawning research. Thanks to the Manuherikia Catchment Water Strategy Group funding I am now investigating the spawning biology of the Manuherikia alpine galaxiid, a fish restricted to approximately 12 km of river habitat in the upper Manuherikia River. Aside from client related work, an opportunity to take part in a NIWA facilitated workshop on fish passage was a good chance to visit Hamilton for the first time in a few years. I also hope to be kicking off a round of fish ID and electric fishing training courses over the summer and am looking forward to a few days fishing with people on these courses.

The Upper Manuherikia River and habitat for the Manuherikia alpine galaxias, 1 September 2016.



NON-PROFIT ORGANISATIONS

Working Waters Trust

👤=0.75



Through collaboration and creativity, our trust has had another great year of conservation action for threatened native fish. Our founder and director, **Lan Pham**, has been directing from the sub-tropical idyllic Raoul Island, joined by another of our trustees, **Emerson Yeoman**. Projects Manager and trustee, **Sophie Allen**, has taken the plunge and bought her first house with a great vege garden and orchard. Trustee **Matt Wylie** is in reclus to finish the write-up of his PhD from the University of Otago, and our Chairperson, **Nicki Atkinson**, has taken on a new role at DOC with the Waituna Living Water programme in Invercargill.

Great to have success so far with our Canterbury mudfish translocations at Tuhaitara Coastal Park, with more on the cards in other locations. This year we kicked off an ambitious restoration of a boggy paddock on a dairy farm near Oxford back into a wetland that has had a wonderfully enthusiastic response from volunteer helpers. Working Waters Trust has had a year of developing a range of projects to the funding application stage, with fingers crossed a few of them rolled out this coming year.

Canterbury & Otago – Threatened Native Fish Work

Some of the key projects this year for Sophie Allen, Emma MacKenzie (intern), James Tweed (intern) and Kelly Body (intern) have been:

Stream, Wetland & Spring Habitat

Restoration Sites – Restoration of spring heads and wetlands with earthworks, fencing and planting. Installation of cobbles for the *Galaxias* species 'D'.

Species Translocations – Translocations of Canterbury mudfish (*Neochanna burrowsius*) at Tuhaitara Coastal Park, and annual fish monitoring.

Project Development – Project development phase of the Community Fish Kit (toolbox to connect with local streams and spotlight for native freshwater fish); assisting feasibility study and funding bids for a Lawrence community wetland; and targeted education associated with restoration works.

Education Programme – Local Ngāi Tahu rūnanga support to hold wānanga, planting events, and advocacy programmes; design and installation of interpretation panels and signage; and advocacy via submissions.

Collaborators: Te Kōhaka o Tūhaitara Trust, Forest and Bird North Canterbury Branch, Landowners, Schools, Enviroschools Canterbury, Te Rūnanga o Waihao, Kāti Huirapa Rūnaka ki Puketeraki, Landcare Trust 'Pathways for the Pomahaka' Project, Clutha Development, Creative Intentions Ltd, Lawrence Tuapeka Community Board...and many others **Outputs:** Funder reports available on request (DOC, Environment Canterbury, WWF, Otago Participatory Science Platform, Rātā Foundation).

Projects manager Sophie Allen and intern Emma MacKenzie monitoring Canterbury mudfish at Tuahitara Coastal Park, North Canterbury.

Photo © Greg Byrnes



St Andrews School students with a sign designed by Working Waters Trust.

Photo © Steve Fennessey



USEFUL LINKS

- **Christchurch City Council – Waterways monitoring**
www.ccc.govt.nz/environment/water/waterways/monitoring
- **Christchurch City Council – Water monitoring reports**
www.ccc.govt.nz/assets/Documents/Environment/Water/Monitoring-Reports/Ka-Putahi-Kaputone-Creek-Realignment-Baseline-Survey-PDF-2.7-MB.PDF
- **Christchurch City Council – Water quality of instream springs**
www.ccc.govt.nz/assets/Uploads/Water-quality-of-instream-springs-in-Waimairi-and-Wairarapa-Streams-2015-PDF-10.6-MB.pdf
- **Department of Conservation – NZ Fish Passage Advisory Group**
www.doc.govt.nz/nature/habitats/freshwater/fish-passage-management/advisory-group
- **EOS Ecology – Public engagement & education projects**
www.eosecology.co.nz/Our-Projects/Engagement.asp
- **Fish & Game Otago – Boffins study lake hayes algae**
www.scene.co.nz/queenstown-news/boffins-study-lake-hayes-algae
- **Fish & Game Otago – Habitat protection management**
otago.fishandgame.org.nz/content/habitat-protection-management
- **Greater Wellington – Benthic cyanobacteria blooms report**
www.gw.govt.nz/assets/council-publications/REPORT-Benthic-cyanobacteria-blooms-in-rivers-in-the-Wellington-Region-A-decade-of-monitoring-and-research.pdf
- **Greater Wellington – Toxic algae report**
www.gw.govt.nz/assets/Our-Environment/Environmental-monitoring/Environmental-Reporting/Technical-publications/f-WRC18157-Toxic-Algae-5-LR-web.pdf
- **Land Air Water Aotearoa (LAWA)**
www.lawa.org.nz
- **Tasman District Council – Our Waters in Common (film)**
www.tasman.govt.nz/environment/water/rivers/our-waters-in-common
- **University of Otago – What can be done to stop lake snot?**
www.stuff.co.nz/science/81151269/What-can-be-done-to-stop-lake-snot
- **Waikato Regional Council – Wadeable streams**
www.waikatoregion.govt.nz/tr201446 ■

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- Baker *et al.* (in press). First observations of spawning nests in the pouched lamprey (*Geotria australis*).
- Banks, J.C.; Demetras, N.J.; Hogg, I.D.; Knox, M.A.; West, D.W. (2016). Monitoring brown trout (*Salmo trutta*) eradication in a wildlife reserve using environmental DNA. *New Zealand Natural Sciences* 41: 1–13.
- Bayer, T.K.; Schallenberg, M.; Burns, C.W. (2015). Contrasting controls on phytoplankton dynamics in two large, pre-alpine lakes imply differential responses to climate change. *Hydrobiologia* 771: 131–150. doi:10.1007/s10750-015-2625-2
- Biessy, L.; Atalah, J.; Beuzenberg, V.; Kuhajek, J.; Wood, S.A. (2016). Measuring the influence of nutrients and river water on the photosynthetic efficiency of *Didymosphenia geminata* using pulse amplitude modulated fluorometry. *Diatom Research*. DOI.org/10.1080/0269249X.2016.1182074
- Borges, H.; Wood, S.A.; Puddick, J.; Blaney, E.; Hawes, I.; Dietrich, D.R.; Hamilton, D.P. (2016). Intracellular, environmental and biotic interactions influence recruitment of benthic *Microcystis* (*Cyanophyceae*) in a shallow eutrophic lake. *Journal of Plankton Research* 38(5): 1289–1301. doi:10.1093/plankt/fbw046.
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- Burns, C.W.; Duggan, I.C.; Banks, J.C.; Hogg, I.D. (2016). A new, subalpine species of *Daphnia* (Cladocera, Anomopoda) in the *D. carinata* species complex, in the South Island, New Zealand. *Hydrobiologia*. doi:10.1007/s10750-016-2702-1
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CONFERENCES

New Zealand Freshwater Sciences Conference 2016

The 2016 NZFSS Conference – Freshwaters on the Edge, Ki Uta Ki Tai – will be held at the Ascot Park Hotel in Invercargill, from the 5–8th December. More information is available at www.nzfssconference.co.nz. We look forward to seeing you there!

New Zealand Freshwater Sciences Conference 2017 www.isrs217.com



NZ FRESHWATER SCIENCES SOCIETY ANNUAL CONFERENCE
19-24 November 2017 | Hamilton, New Zealand

International Society for River Science

rivers GROUP

In association with the 5th Biennial Symposium of the International Society for River Science (ISRS) and IPENZ/Water NZ Rivers Group Annual Meeting.
In partnership with the Waikato River Authority (WRA)

Waikato River Authority

WELCOME

We are pleased to invite you to the 2017 New Zealand Freshwater Sciences Society (NZFSS) Annual Conference, in association with the 5th Biennial Symposium of the International Society for River Science (ISRS) and the annual meeting of IPENZ/Water NZ Rivers Group. These Conferences are being held at Claudelands Events Centre in Hamilton from 19-24 November 2017, in partnership with the Waikato River Authority (WRA).

CONFERENCE THEME

"Integrating multiple values"

Working rivers provide a range of goods and services that are important for biodiversity, ecological functions and human use. Balancing these multiple needs is a key challenge for water resource managers, and achieving outcomes that satisfy growing human demands while protecting environmental values is extremely difficult. This conference will provide a forum for sharing scientific and environmental knowledge underpinning management of rivers for multiple goals.

WHO SHOULD ATTEND?

The conference is targeted for a multidisciplinary audience of 300-500 delegates from the physical, natural and socio-economic sciences, as well as those who manage, create policy for and use riverine resources and their associated aquatic environments.

CONFERENCE FORMAT

The conference will include plenary speaker presentations as well as special and general contributed sessions, poster displays, a diverse array of exhibits, networking functions, and field trips that showcase New Zealand's unique river environments and attractions.

CALL FOR SPECIAL SESSIONS

CLOSES 30 NOVEMBER 2016

The programme will include a series of Special Sessions (oral platform presentations organised by individuals) relevant to the conference theme. Proposals that foster international collaboration are highly encouraged. Special session topics, along with a list of proposed speakers and their topics, should be sent to Kevin Collier – kcollier@waikato.ac.nz. Please see the website for guidelines.

KEY DATES

- Special Session Nominations Close 30 NOV 2016
- Abstracts Open 1 DEC 2016, Abstracts Close 30 APRIL 2017
- Registration Opens 1 MARCH 2017
- Early-bird Registration Close 15 SEPTEMBER 2017

Mike Hickford (UC) & Shelley McMurtrie (EOS Ecology) with
their display of live inaka educationing local school kids during
World Fish Migration Day celebrations at Opawa School.
.....

Photo © EOS Ecology / Bronwyn Gay

AWARDS





New Zealand Freshwater Sciences Society Medal Recipient 2014 Prof. Colin Townsend

At our 2015 conference I had the pleasure of awarding the 2014 New Zealand Freshwater Sciences Society Medal to its recipient, Professor Colin Townsend. Colin surely deserved this award as his name is globally associated with freshwater science due to his long and productive career as a freshwater scientist both in the UK and in New Zealand, but also because of the seminal text book, *Ecology: From Individuals to Ecosystems*, that he has co-authored, which is now in its 4th edition. In my presentation speech, I could do no better in praising Colin than by quoting some of the many letters of support from his colleagues that accompanied his nomination for the award. These mentioned his outstanding publication record which includes three important text books, the importance of his work in ecology as indicated by his citation record, his inspired and inspiring teaching of ecology and freshwater science, his long tenure as co-editor of the highly respected journal *Freshwater Biology*, his election as Fellow of the Royal Society of New Zealand and his membership

in other academic societies...the list goes on. However, his nominators (and I echo them) also spoke of his warmth, sense of humour, humility, interests outside of work, his mentorship and genuine friendship. So on behalf of the NZFSS, I would like to thank Colin again for all that he has contributed to the field of freshwater sciences and for promoting New Zealand as an important centre of freshwater science research to the rest of the world. He is a very worthy recipient of our Society's highest honour.

Marc Schallenberg
PRESIDENT

See freshwater.science.org.nz/index.php/awards/nzfss-medal for further information about the rules and criteria for the NZ Freshwater Sciences Society Medal and Honorary Membership.

The Society offers a variety of awards at the annual Freshwater Sciences conference, as well as funding to assist students with travel costs to attend the conference. Check out our website for further details through the links supplied further on.

Travel Awards

V.H. Jolly Student Travel Awards are available to assist students with travel costs to the annual Freshwater Sciences Conference – for further information, see the 'students' page on the NZFSS website: freshwater.science.org.nz/index.php/students

Conference Awards

Best Student Paper Award: freshwater.science.org.nz/index.php/awards/best-student-paper-award

Best Student Paper Award recipients: freshwater.science.org.nz/index.php/awards/best-student-paper-award-recipients

Recent recipients of other awards: freshwater.science.org.nz/index.php/awards/recent-award-recipients

S.I.L. Trust Awards

The Society administers grants for student and young researcher overseas travel, and visits by eminent overseas scientists through the S.I.L. 1987 Trust Fund. These awards help to facilitate international spread of freshwater science. The awards committee were pleased to announce the recipient for the 2016 S.I.L. Trust Travel Award was Simon Stewart. The S.I.L. Trust Guest Lecturer Award was not awarded this year, as funds were low. For further information about these awards, visit the links below.

S.I.L. TRUST FUND (1987) GUEST LECTURER AWARD

For visits to and/or within New Zealand by eminent overseas limnologists, whose visits will benefit New Zealand's limnological research community as a whole.

freshwater.science.org.nz/index.php/awards/sil-1987-trust-fund-guest-lecturer-award

S.I.L. TRUST FUND (1987) TRAVEL AWARD

For young scientists to attend overseas conferences, seminars or workshops, or to visit institutions to learn techniques, develop expertise, use equipment, collections or library facilities not available in New Zealand.

freshwater.science.org.nz/index.php/awards/sil-trust-fund-1987-travel-award

Student Travel Award Trip Report

This year I received the SIL Trust Student Travel Award to attend the Peter Yodzis Colloquium on fundamental food web ecology at Guelph University in Ontario, Canada. This is a semi-annual event organised in memory of the late Peter Yodzis which aims to provide a forum to discuss pressing topics within food web ecology. This year's theme was "aquatic ecosystems in a changing world: from individuals to whole webs". This was a small (approx. 45 participants) event where the eight invited speakers were a range of international experts that each provided unique perspectives on aquatic food web ecology. I presented a poster at the conference entitled "The lowest recorded consumer excretion N:P?" where I presented extremely low excretion N:P ratios observed in smelt from Lake Taupō. The small, intimate nature of the meeting meant that I was able to have many good conversations with researchers who I have cited many times and get great feedback on my own research. I don't believe that this level of interaction would have been possible at a larger meeting. After the colloquium I travelled to UC Davis in California, USA, to meet with collaborators doing comparative research on Lakes Tahoe and Taupō. As well as developing research ideas and being exposed to the facilities of another research institution, I was able to conduct field work in Lake Tahoe. I hope that the samples collected will allow comparisons between the degree of nutrient recycling in Tahoe and Taupō.

I am extremely grateful for all of the experiences, knowledge and inspiration that this trip provided me. Now I am excited to incorporate these ideas into the final aspects of my PhD work.

Simon Stewart
PHD CANDIDATE, UNIVERSITY OF WAIKATO



The lowest recorded consumer excretion N:P?



Simon D. Stewart¹, David P. Hamilton¹, W. Troy Baisden², Ian C. Duggan¹, Piet Verburg³

¹School of Science, University of Waikato, New Zealand

²National Isotope Centre, GNS Science, New Zealand

³NIWA, New Zealand

Contact: Simon Stewart: sds20@students.waikato.ac.nz

Introduction: *Retropinna retropinna* (common smelt) are a planktivorous fish released into Lake Taupo, New Zealand's largest lake, c. 1936 as a fodder for the waning rainbow trout fishery (Stephens 1984). We performed consumer nutrient excretion incubation experiments on common smelt in Lake Taupo. Dissolved inorganic nutrient excretion (i.e. ammonium and phosphate) consistently had an N/P ratio of 0.67 ± 0.21 , lower than both RNA and phospholipids (the most P-rich organic molecules). Here we present data to highlight: i) mechanisms causing such anomalous stoichiometry and; ii) potential for smelt to elicit nutrient recycling mediated trophic cascade effects.

Causes

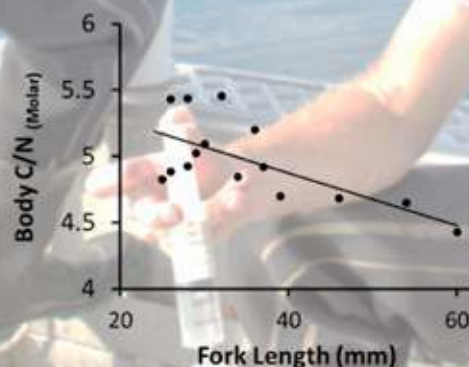
Stoichiometric diet imbalance:

Comparison of smelt body, excretion and resource (zooplankton) N/P stoichiometry indicated that high P content in zooplankton relative to smelt requirements drives low N/P smelt excretion.



Growth dilution hypothesis:

A significant relationship between fork length and tissue C/N suggested smelt accumulate protein (N) as they grow while structural tissue and RNA (P) pools remain constant (Elsner et al. 1996). Thus growth dilution potentially contributes to driving smelt excretion N/P in Lake Taupo.



Common smelt grow up to 60 mm over three years



Fish were collected bimonthly seine netting along six beaches



Fish were incubated for 1 hr in RO water. Filtered sample water was then analysed for DRP, NH_4^+ and $\text{NH}_4^+ \delta^{15}\text{N}$

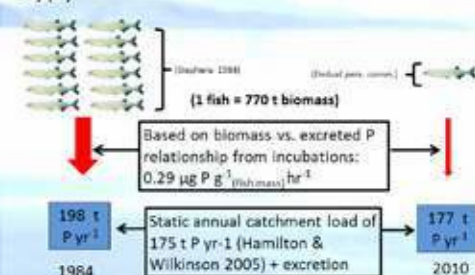
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Effects

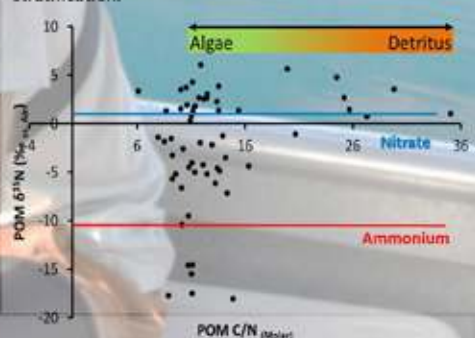
Contribution of smelt excretion to lake P budget:

Based on 1984 biomass estimates smelt excretion contributed 13% of the total lake P supply. Recent monitoring data (*Dedual pers. comm*) shows that smelt biomass can reduce to <10% of 1984 levels (i.e. 2010) resulting in a 21 t P yr^{-1} reduction in P supply.



Stable isotope evidence for significant contribution of consumer nutrient recycling:

Extremely negative particulate organic matter (POM) $\delta^{15}\text{N}$ values correspond to utilising rapidly cycled ammonium (red line) during austral summer stratification. Negative $\delta^{15}\text{N}$ values are indicative of significant consumer nutrient recycling (Somes et al. 2010). POM samples exhibiting negative $\delta^{15}\text{N}$ values had C/N ratios of pure phytoplankton suggesting that rapid ammonium recycling drives productivity during stratification.



Summary:

- Extreme low N/P excretion observed in Lake Taupo smelt is likely caused by stoichiometric diet imbalance and high protein accumulation and RNA turnover during growth.
- Multiple lines of evidence (nutrient excretion incubation, time-series and stable isotope data) indicate that smelt excretion is driving ecosystem-wide effects on productivity.

Future direction:

- Integrate time series data (i.e. ecosystem dynamics) with stable isotope food web data (i.e. food web structure) to inform a predictive ecosystem model.

BUDGET FOR THE YEAR ENDED 30 JUNE 2015

NZ Limnological Society (Inc)
t/a NZ Freshwater Sciences Society
Statement of Financial Performance
for the Year ended 30 June 2015

	2015	2014
	\$	\$
Income		
Book Sales	274	122
Cost of Sales		
Opening Stock	8,805	9,480
Closing Stock Before Write Off	8,655	
Stock Write Off	(8,655)	
Closing Stock	-	8,805
	<u>8,805</u>	<u>675</u>
Gross Profit / (Loss)	<u>(8,531)</u>	<u>(553)</u>
Other Income		
Interest Received	1,976	1,799
Subscriptions	17,431	6,505
Conference Income	14,771	9,419
Conference Seed Funding Reimbursed	4,398	5,000
Donations	-	144
Meeting Income		12,000
Donations Student Prizes	5,050	13
	<u>35,095</u>	<u>34,327</u>
Expenses		
Award -NZFSS Best Student Paper	500	500
Award - SIL Trust Prize	800	800
Award - Jolly Student Travel	600	800
Audit Fee	4,200	2,100
Bank Charges	582	533
General expenses	438	
Conference Seeding Fund		4,398
Gifts	3,102	135
Meeting Expenses		12,000
Membership Fees	1,200	1,200
Newsletter	481	471
Other	13	
Postage	124	136
	<u>12,040</u>	<u>23,073</u>
Net Surplus for year	<u>23,055</u>	<u>11,254</u>

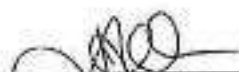
Statement of Movements in Equity
for the Year ended 30 June 2015

	2015 \$	2014 \$
EQUITY		
Opening Balance	89,265	78,011
Movement for the Year		
Current Years Surplus/(Deficit)	23,055	11,254
Total Equity	<u>112,320</u>	<u>89,265</u>

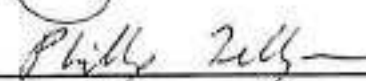
Statement of Financial Position
as at 30 June 2015

	2015 \$	2014 \$
ASSETS		
Current Assets		
Bank of New Zealand	53,253	27,893
Accounts Receivable	5,910	-
Interest Accrued	819	401
Prepayments	5,000	-
Stock on Hand	-	8,805
	<u>64,983</u>	<u>37,099</u>
Investments		
BNZ Term deposit	53,207	51,729
	<u>118,189</u>	<u>88,828</u>
Total Assets		
	<u>118,189</u>	<u>88,828</u>
LIABILITIES		
Current Liabilities		
Accrued Expense	2,100	-
Donations owed to SIL Trust	117	-
Subscriptions in Advance	83	-
GST	3,569	(437)
Total Liabilities	<u>5,869</u>	<u>(437)</u>
EXCESS ASSETS OVER LIABILITIES	<u>112,320</u>	<u>89,264</u>
EQUITY		
Members Funds	112,320	89,264
	<u>112,320</u>	<u>89,264</u>

Approved by Executive

Signed 

Date 19 - 4 - 2016

Signed 

Date 9/5/16

1. STATEMENT OF ACCOUNTING POLICIES

The financial statements presented here are for the entity the NZ Limnological Society (Inc) an Incorporated Society under the Incorporated Societies Act 1908.

These financial statements have been prepared in accordance with generally accepted accounting practice. The accounting principles recognised as appropriate for the measurement and reporting of earnings and financial position on an historical cost basis have been used, with the exception of certain items for which specific accounting policies have been identified.

(b) Changes in Accounting Policies

There has been one change in accounting policy from the previous year. The Subscription Income policy has changed to now ensure that unpaid subscription revenue is now recorded as accounts receivable to ensure income is recorded in the correct period

This has resulted in an increase in Income and Accounts Receivable of \$5,910

All other policies have been applied on bases consistent with those used in previous years.

(c) Differential Reporting

The NZ Limnological Society (Inc) qualifies for Differential Reporting because:

- It is not publicly accountable, and
- it is deemed to be 'not large' due to the following criteria –
 - * the gross turnover is less than \$20 million, and
 - * the total assets are less than \$10 million, and
 - * there are less than 50 fulltime employees.

The NZ Limnological Society (Inc) has taken advantage of all available differential reporting exemptions.

(d) Income Tax

The NZ Limnological Society (Inc), is exempt from income tax as it is a scientific research body as defined by section CW 49 of the Income Tax Act 2007

(e) Goods & Services Tax

The statement of financial performance has been prepared so that all components are stated exclusive of GST. All items in the statement of financial position are stated net of GST with the exception of accounts receivable and accounts payable which include GST.

(f) Investments

Investments are carried at the lower of cost and net realisable value,

(g) Inventories

The Society sells copies of The Guide to Freshwater Crustacea of NZ. Inventory is valued at the lower of cost and net realisable value on a first in first out basis.

(h) Receivables

Receivables are stated at their estimated realisable value. Bad debts are written off in the year in which they are identified.

(i) Subscription Income

The subscription income is due from the members July of each year to cover the period from July to June of the following year. Subscription income is recognised as it is received. Unpaid subscriptions are recognised as a debtor at year end. Subscriptions that are paid in advance during the year are recognised in the Statement of Financial Position.

2. AUDIT

These financial statements have been subject to audit. Please refer to the Audit Report.

3. CONTINGENT LIABILITIES

At balance date there are no known contingent liabilities (2014: nil). The NZ Limnological Society (Inc) has not granted any securities in respect of liabilities payable by any other party whatsoever.

4. CAPITAL COMMITMENTS

At balance date there were no known capital commitments. (2014: nil).

5. EVENTS SUBSEQUENT TO BALANCE DATE

No events or transactions have occurred since balance date which would have a material effect upon the financial statements or which are of such significance as to require mention in these notes to the financial statements. There are no plans or intentions that may materially affect the current value or classification of assets and liabilities.

MINUTES OF THE 48TH ANNUAL GENERAL MEETING OF THE NEW ZEALAND LIMNOLOGICAL SOCIETY INC.

(Trading as New Zealand Freshwater Sciences Society)

[FOR APPROVAL: Minutes to be approved and confirmed as true record at the 2016 AGM]

Held at Silverstream, Lower Hutt, Thursday 26 November 2016.

The Annual General Meeting commenced at 12:37 pm and was chaired by Marc Schallenberg, President.

Present: Marc Schallenberg, President; Phil Jellyman, acting Secretary-Treasurer, and 57 members.

1. Apologies

Vivienne Cassie-Cooper, Jane Kitson

2. Minutes of the 46th AGM circulated

Matters arising from minutes: Dealt with under general business.

Motion: That the minutes be accepted as a true and correct record of the 47th AGM.

(Avalon Edwards / Greg Burrell – carried)

3. President's report [Marc Schallenberg]

Since taking over the presidency of the NZFSS from David Hamilton in January, my first 8 months of engagement in the role have consisted of "learning the ropes" of how our Society functions, with the assistance of many skilled and helpful colleagues. I'd like to thank the members of our Executive Committee, and especially our Secretary/Treasurer Janine Wech, who have so ably helped guide Society (and its new President) through a busy year.

Over the past year, the NZFSS has been asked to input its expertise into a wide array of environmental debates and policy developments and this is where the majority of our work has been directed this year. This is very positive, because each request for our feedback is a chance for the Society to share its expertise and to be a serious player in these debates and policies. This heightens our profile, sharpens scientific debate among our members and contributes the best available scientific information to public debates and policy decisions. Thank you to all of our members who've taken the time this year to provide feedback for our Society's submissions. Your efforts and generosity are very much appreciated.

ACTIVITIES

Along with the usual administrative tasks that the Exec performs, the Exec has been involved with a number of issues year, including:

- Providing a letter of support (via the International Society of Limnology (SIL)) regarding environmental impact studies to do with a proposal to construct a canal linking the Atlantic and Pacific Oceans via Lake Nicaragua
- Providing a letter of support for our Australian colleagues to host the 2019 American Society of Limnology and Oceanography (ASLO) conference in Brisbane
- Preparing submissions for the Ministry for the Environment on the Draft Implementation Guide to National Policy Statement – Freshwater Management (NPS-FM), on their proposed guidelines on Freshwater Accounting in the NPS-FM, and for the Ministry of Primary Industries on their draft National Environmental Standards for Production Forestry (NES-PF)
- Participating in a Science-to-Policy workshop of the Land and Water Forum
- Providing input to the 2015 conference organising committee.

The NES-PF caught the attention of many of our members and I feel that we made a very valuable contribution to the policy debate around guidelines to protect freshwaters affected by production forestry. Our submissions to the Ministry for the Environment and the Ministry of Primary Industries are available on the NZFSS website: freshwater.science.org.nz/index.php/bulletin-board/#submissions.

Opportunities for the Society to submit on government policy will continue in 2016 and you will continue to receive emails when the opportunities for submission arise. Please feel free to send us your thoughts and comments.

SPECIAL KUDOS & OPPORTUNITIES TO JOIN THE EXEC

In recent years, the activities of the NZFSS have been including more community engagement and more advocacy for science/evidence based policy development. To facilitate this, we established new co-opted positions on the Exec to help us carry out these roles. Kate McArthur and Ngaire Phillips have been spearheading our advocacy role this year and I'd particularly like to thank Kate and Ngaire not only for organising, but also for often contributing substantially, to our submissions to Government Ministries. Unfortunately for us, Ngaire has had to step down from her role as submissions co-ordinator. Luckily Kate has indicated that she can still contribute and Richard

Allibone has also offered to help with submissions. However, we would like to co-opt another member to help spread the work load in our important and growing activities in freshwater advocacy and policy engagement.

I'd also like to thank Jay Piggot for his excellent work in designing and maintaining the NZFSS website and running the NZFSS email bulletin. Unfortunately for us, Jay has indicated that he'd like to pull back somewhat from these activities, but he is happy to help train up a new webmaster.

So the Exec is looking for some new talent. More on this later in the AGM.

LOOKING FORWARD – CASH RESERVES AND WHAT TO DO WITH THEM

The society has recently accumulated substantial cash reserves and this needs to be addressed. These reserves give us opportunities to do new things that are aligned with our objectives and mission. To help develop and focus the opportunities, the Exec would like to set up a formal planning process for the NZFSS, involving an Annual Plan and a 5-Year Plan. More on this later in the AGM.

SUMMARY

In summary, it's been a busy and fruitful year for the NZFSS. We are definitely in good "health" whether measured by the Society's activities and engagement, financial position or memberships. I've really enjoyed working in my capacity as President with many of you, both inside and outside the Exec. All of the Exec team are keen to discuss ideas and concerns with any of the members to help the Society fulfil its goals in the best possible ways. Feel free to get in touch with any of us and to take any opportunities to provide feedback to us. We look forward to serving the society again in 2016.

I move from the Chair that this report be accepted.

(David Hamilton – carried)

4. Secretary-Treasurer's report [Janine Wech]

MEMBERSHIP

Total membership as at November 2015 was 479, compared with 465 in 2014. Membership figures for the last five years are shown in Tables 1 and 2. The number of members in arrears by 2 years is creeping up again (Table 1). This reflects members who we have lost contact with, or who may have moved away from freshwater science and have not resigned from the Society. Membership by member type (Table 2) shows the breakdown of membership regardless of financial status, and shows that waged and student member numbers are relatively stable.

Table 1: Financial status of membership

	2015	2014	2013	2012	2011
Members – Current:					
Paid	236	224	248	221	268
Unpaid	122	132	97	120	140
Members – in arrears:					
1 year	55	58	45	103	-
2 year	39	23	83	-	-

Other:

Honorary	9	9	10	10	11
Life	4	4	4	4	4
Legal*	1	1	1	1	1
Societies	5	5	5	5	5
Libraries	9	9	9	9	9
TOTAL	479	465	502	473	438

* Not a member; a legal requirement

Membership by type shows the breakdown of our membership regardless of financial status (Table 2).

Table 2: Type of membership

	2015	2014	2013	2012	2011
Ordinary	337	326	345	329	304
Corporate	113	108	13	13	15
Honorary	9	9	10	10	11
Life	4	4	4	4	4
Unwaged/ Student	5	5	125	112	99
Other (Societies)	11	9	5	5	5

FINANCES

Crowe Horwath now audits the accounts (having taken over Angela Wood accountancy practice). They have made one change in accounting policy. The Subscription Income policy has changed to now ensure that unpaid subscription revenue is now recorded as accounts receivable so that income is recorded in the correct period. This has resulted in an increase in income (\$5,910) for the financial year ending 30 June 2015.

Total assets as at 30 June 2015 was \$118,189, and includes our current account, our Jolly term deposit, as well as unsold stock of "The Guide to the Freshwater Crustacea of New Zealand". As this book is now considered 'slow-moving inventory', the remaining stock has been written off under accounting conventions (allowing it to be correctly recorded at Net Realisable Value). The book can still be sold by the Society, with the selling price recognised as profit – it just means that there is no carrying value in the Society's books.

Income earned for the 2015 financial year came from conference profit, subscriptions, and interest earned from our bank account and term deposit.

Expenditure items for the 2015 financial year included audit fees, RSNZ membership fees, hardcopy newsletter and postage, bank charges and donations to the SIL Trust.

A net surplus of \$23,055 was made for the Society for the year ended 30 June 2014. This compares with a net surplus of \$11,254 for the 2014 financial year.

I request that the Secretary-Treasurer's report be accepted

Motion: That the Society accounts for 2014–2015 be accepted.
(Phil Jellyman / Jeremy Piggot – carried)

I move that the auditor appointed to conduct the Society audit for the 2015 financial year be Crowe Horwath NZ Ltd.

Motion: That the Auditor for the next financial year be Crowe Horwath NZ Ltd., Blenheim.

(Phil Jellyman / Sjaan Bowie – carried)

5. SIL 1987 Trust Fund report [Marc Schallenberg for Kit Rutherford]

Note: No SIL members were in attendance this year. SIL Treasurer Kit Rutherford provided a treasurer's report in the form of a spreadsheet, which Marc Schallenberg presented.

Total assets as at September 2015 were \$66,644, a net increase of \$1,188 since September 2014. Two awards were made in 2015: N Bodie and J Piggot.

Motion: That the SIL 1987 Trust Fund report for 2014–2015 be accepted.

(Marc Schallenberg / Amber Sinton – carried)

6. General Business

Webmaster role (currently Jeremy Piggot): NZFSS looking for a replacement, ideally someone with web/IT management experience. Marc explained the role. Lisa Carlin (UoO) was present at the AGM and expressed interest in taking up this role.

Advocacy and submissions role: Kate McArthur outlined upcoming work in 2016 for this role and suggested a small committee of people was needed to cope with this large amount of work. (Tanya Blakely let AS know that she was a possibility but will need to consult with her employer first).

- Dean Olsen: Is NZFSS advocacy currently too partial?
- Marc S: We endeavour to provide evidence-based information and the best science for policy.
- Kate McArthur: We take submissions for members, collate these, and provide this information to the government. We thoroughly read policy line-by-line, comment on this and make recommendations. Members are encouraged to respond to emails that are sent out to all of NZFSS regarding their views on policies.
- Marc S: We need editors to make sure what we put forward to the government is well-written. Is everyone happy with this process?
- Kate M: (clarifies the process)

NZFSS medal: This year Colin Townsend was presented his medal at his plenary speech on Thursday 26 November (9:45 am). Clive Howard-Williams will be awarded his medal at the 2016 conference (hopefully).

Future planning for the society (i.e., NZFSS cash balance):

- Marc S: We need to think of some ideas to solve this. (Shows the constitution to illustrate areas we can spend money). We need a planning process which can involve member input, e.g., via an online forum. These plans would be ratified at AGMs.
- Scott Larned: Does that mean the current year's surplus will not be spent for another year?
- Marc S: E.g., for this year...(cut short).
- Angus McIntosh: We have much more money than SIL, which exists to run investments, which is the core aim of the society – we should give more society money to SIL, this should be a main aim for the society.

- Marc S: Yes we can add this to the list and give more money to SIL but there are other good options too.
- Bryce Johnson: We should spend money to get kids into freshwater science.
- David Hamilton: We need to move to update IT more quickly, plus sort out advocacy.
- Kate M: In terms of honorarium?
- David H: No
- Jeremy Piggot: Society is slowly catching up with IT but needs to move membership subs to a more proactive role for members to cut down on work for IT/secretary. This needs to be integrated into the current website. Plus the jobs board needs to be automated. Currently all of this is done manually – i.e., on paper. There will need to be investment into an external IT company to do this.
- Marc S: This is an inevitable move, I propose this is added to the annual plan (motion moved). Seconded by Russell Death (all in favour).
- Scott L: I have concerns about the website – with these new services needed there will need to be professional work on an ongoing basis, rather than just volunteers.
- Jeremy P: A payment system (credit card processing) requires professional management. Additional funds will be required on an ongoing basis. Avenues for revenue will also be created though – book sales, charging for job ads.
- David H: Members of the exec or other delegates sometimes need to attend important forums to represent the society. There should be a small budget made for this – currently representatives have to find their own funds.
- Marc S: It would be good to not have to lean on Wellington people all the time too, also we can then send the most suitable people. Motion moved by David Hamilton to add this to the annual plan. Seconded by Gerry Closs (all in favour).
- Marc S: There is discontent with the NOF – a discussion document to support NOF development.
- Russell D: NOF – compare this to Australian scientists, who appear to be doing a very good job. NOF has political inputs that have an influence on the science – the society should make stronger submissions to support the science and not be swayed by politics.
- Bryce J: NOF – The society should make an independent and focused effort to promote the science over all else.
- Dean O: Advocacy – remember that not everyone in the society have time for this plus some work for the MfE – there are conflicts of interest. We need to discuss how to go about this and present a single society view, avoid being a political pawn, and maintain integrity. There needs to be a clear process.
- Keith Hamil: There needs to be a good peer review process – I have concerns over the narrative of some previous submissions.
- Marc S: We need to pursue this further, probably using online methods – forums, Facebook, email – as we are out of time now.

The meeting closed at 1:25 p.m. ■

ABOUT THE NEW ZEALAND FRESHWATER SCIENCES SOCIETY

The New Zealand Freshwater Sciences Society (NZFSS) began as the New Zealand Limnological Society (Limsoc) founded in 1968. It adopted a new trading name in 2005 to reflect the broad interests of current and new members whose interests span freshwater science, education, conservation and management. The society aims to:

“establish effective liaison between all persons interested in any aspect of fresh and brackish water research in New Zealand, and to encourage and promote these interests”

The society achieves this by:

- holding workshops and annual conferences,
- co-operating with other scientific bodies (see links to related sites),
- producing one newsletter per year,
- maintaining a membership register,
- communication through emailing list and public forum for members,
- listing members' interests,
- listing relevant publications.

Constitution

1. The Name of the Society shall be the New Zealand Limnological Society Incorporated.

2. Objectives: To establish effective liaison between all persons interested in any aspect of fresh and brackish water research in New Zealand, and to encourage and promote these interests.

3. Means of Attaining Objectives:

- a) The establishment and maintenance of a register of all persons working in the appropriate fields in New Zealand, giving details of their current interests.
- b) The holding of meetings and conferences to deliver scientific papers, and to discuss scientific topics.
- c) Co-operation and affiliation with other scientific bodies when appropriate.
- d) The production of a newsletter including information about the current interests of freshwater workers, and listing relevant new publications and other items of interest.
- e) The distribution of the Newsletter to appropriate organisations in New Zealand and overseas.

4. Membership:

- a) **The members** of the Society shall be:
 1. Ordinary members who shall be persons admitted to membership by the committee, and whose annual

subscription as fixed from time to time shall be accepted by the Committee.

2. Unwaged Members who shall be any full-time student of a secondary or tertiary educational institution, and who shall pay such annual subscription as shall be fixed from time to time.
 3. Honorary Members who may be elected at a general meeting on the recommendation of the Committee.
 4. Life Members who shall be persons admitted to membership by the committee, and whose lifetime subscription shall be paid in advance as a single fee as fixed from time to time.
- b) Newly elected members shall be **notified** by the Secretary of their election and sent a copy of the constitution.
 - c) Any member may **resign** by giving notice in writing to the Secretary, and paying all subscriptions due.
 - d) Any member shall notify the Secretary in writing of a **change of address**.
 - e) The Committee shall have the power to **cancel membership** in the case of conduct considered prejudicial to the Society.
 - f) All members are entitled to receive the Society's **Newsletter** free of charge.

5. Executive and Meetings:

- a) There shall be an **Executive Committee** consisting of the President, the immediate Past President (ex officio), the Secretary-Treasurer, the Editor, and two (2) other members,
- b) The Committee shall implement the Society's general business, and a simple majority shall decide all questions at Committee Meetings. If voting is equal, a motion is lost. A quorum at a Committee Meeting shall be three (3).
- c) The officers shall be **elected** every two years, either at a General Meeting or by postal ballot as the existing Committee determine. The postal ballot shall be held before the end of the financial year, and if a General Meeting is not held, the committee shall have the power to scrutinize and count the votes, and declare the results.
- d) The newly elected officers shall take office one (1) month after their election.
- e) **Candidates** for positions as officers shall be nominated at the General Meeting, or in writing signed by two other members, received by the Secretary before the time of such meetings, or by the 31st of August if a meeting is not held. Every candidate shall signify

personally, or in writing his or her acceptance of nomination. The Committee shall have the power to co-opt members of the Society to fill any casual vacancies on the Committee.

- f) The Executive Committee may summon a **General Meeting** or a General Meeting shall be summoned on receipt of a request signed by no fewer than ten (10) members entitled to vote. General Meetings shall be summoned by notice in writing, specifying the business to be considered, and notices shall be posted not less than fourteen (14) days prior to the proposed date.
- g) At all General Meetings, ten (10) members entitled to vote shall constitute a **quorum**, and a simple majority shall carry a motion. Voting shall be on the voices, or by show of hands or by ballot at the discretion of the chairman, provided that, if any member so demand, voting shall be by ballot. The Chairman shall have a deliberative and a casting vote.
- h) **Votes of members:** Each Member shall have one (1) vote at a General Meeting, and each Affiliated Body shall have the right to appoint a delegate who shall have one vote at a General Meeting.

6. Finance:

- a) **Annual Subscription:** shall be due on the 1st of July in each year and the amount shall be fixed at a General Meeting. Members whose subscriptions are not paid by the succeeding 30th of June shall be unfinancial and shall be liable to forfeit all benefits of membership. The financial year shall conclude on the 30th of June.
- b) **The funds** of the Society shall be controlled by the Executive Committee and shall be banked in the name of the Society. Cheques and bills shall be signed by any one of the President or Secretary-Treasurer, and must be approved in writing by other members of the Executive Committee. The Society shall not have the power to borrow money.
- c) Any income, benefit or advantage shall be applied to the **charitable purposes** of the Society as described in Sections 2 and 3 above.
- d) No member of the Society, or any person associated with a member, shall participate in or materially influence any decision made by the Society in respect of the payment to or on behalf of that member or associated person of any income, benefit or advantage whatsoever.
- e) Any such income paid shall be reasonable and relative to that which would be paid in an arm's length transaction (being the open market value).
- f) The provisions and effect of clauses 6(c), 6(d) and 6(e) shall not be removed from this document and shall be included and implied into any document replacing this document.
- g) **Payment of accounts** must first be approved by the Executive Committee. This may be done at a meeting or by mail, and items may be approved in advance for one financial year.
- h) **An Annual Report and Financial Statement** shall be prepared and posted to members. The Financial Statement shall be audited by a person appointed at the previous General Meeting.

7. Organisation:

- a) The Secretary-Treasurer shall keep (i) a **Minute Book** containing full minutes of all meetings, and (ii) a **Register** with the names, addresses, professional interests and date of joining of all members.
- b) **Affiliated Bodies:** Incorporated or unincorporated bodies, and other organisations approved by the Committee, may become affiliated with the Society on acceptance by the Committee, and on payment of such annual subscription as may be fixed from time to time.
- c) **Changes in the Constitution** may be made only on a two-thirds majority of the votes polled, and this vote shall be conducted by letter.
- d) No addition to or alteration or recession of the rules shall be approved if it affects the **charitable objects**, the **personal benefit clauses**, or the **winding up clause**, except as specified under clause 7(g) below.
- e) **The Common Seal** of the Society shall be in the custody of the Secretary, who shall in pursuance of a resolution of the Committee to that effect, affix the same to all instruments requiring the same.
- f) The Society shall not be wound up except on a two-thirds majority of a postal vote, but shall be dissolved in the event of the membership being fewer than five (5) persons. In the event of **dissolution** of the Society, its assets shall become the property of the Royal Society of New Zealand which shall dispose of the assets in accordance with the aims of the Society.
- g) The provisions and effects of this clause 7(f) shall not be removed from this document and shall be included and implied into any document replacing this document, except that another organisation, which must be an **Inland Revenue Department approved charitable organisation**, may be named in place of the Royal Society of New Zealand.

Membership

Membership is open to anyone with an interest in freshwater sciences, management and education in New Zealand and internationally. Members are entitled to attend the annual Society conference and associated workshops on topical issues, and to receive an annual newsletter detailing recent work at research institutions, members' addresses and interests, and recent publications. The Society administers grants for conference travel and visits by overseas scientists through the SIL Trust Fund. The Society also makes submissions to government bodies on behalf of members.

The Society currently has over 350 members coming from a wide range of backgrounds, including research institutes, regional and district councils, government environmental and conservation organisations, universities and consultancies. Members' freshwater interests include:

- native freshwater fish,
- sports fishery management,
- aquatic invertebrate ecology,
- zooplankton and phytoplankton taxonomy and ecology,
- macrophytes and periphyton ecology,
- lakes, rivers and wetlands,
- water quality management,

- aquatic biosecurity,
- human perceptions of water,
- conservation and restoration of freshwater ecosystems,
- resource management,
- science education.

To become a member, please fill out the membership application form and post or email this form to the Society Secretary-Treasurer.

Executive & Meetings

See page 3.

History of NZFSS

New Zealand Freshwater Sciences Society was founded in 1968 by a group of freshwater scientists interested in maintaining links in their field. It was also a time of increasing public interest in the management of freshwaters with lake weed and eutrophication issues in several areas, the newly passed Water and Soil Conservation Act 1967 and the first national environmental campaign to 'Save Manapouri' questioning further hydroelectric power development. Society membership remained relatively small during the 1970s, with annual conferences held throughout the country attended by about 30 members to discuss research and provide opportunities to visit areas and collect samples.

By the late 1970s and early 1980s, New Zealand was considering various options for future freshwater management during the 'think big' era which led to an increase in freshwater investigations and reviews of freshwater policy as well as research opportunities. This time was characterised by the management issues including development of the MCI and national debates about 'wild and scenic' rivers. A highlight for the Society at the end of the period was the highly successful running of the SIL conference in 1988 in Hamilton, the first of these to be held in the southern hemisphere.

By the late 1980s environmental and tertiary education reviews were affecting the context for education, research and management. This culminated in the reorganisation of water management through the Resource Management Act 1991, with the associated demise of considerable central government funding, the National Water and Soil Conservation Authority, DSIR and Water Quality Centre, environmental government departments, catchment boards and Acclimatisation Societies and their replacement with the Ministry for the Environment, NIWA, Department of Conservation, regional councils and Fish & Game councils, respectively.

The 1990s saw the decentralisation of freshwater management and a growing proportion of society membership made up of local and central government officers and policy makers, as well as significant increases in under- and post-graduate student numbers with expanding Universities. Society membership expanded steadily through this period. The importance of freshwater as an economic and environmental resource has remained high, with considerable expansion of water use and concerns about environmental

degradation. Water management has become more sophisticated through regional plans and more complex requirements on water users through resource consent processes.

Over the last 10 years the economic value of water has increased in proportion with its perceived scarcity, with increasing concerns expressed about maintenance of water quality with increasing intensification of land use. Development of complex modelling of, for example, effects of river flow changes on biota, pollutant transport, land use effects on water, has challenged freshwater scientists to provide answers to complex technical issues. Society numbers have continued to steadily grow, with more emphasis on liaison, education and policy and better links with other societies, especially with the Australian Society of Limnology with which the Society has joint conferences every four years since the first joint meeting at Wairakei in 1999. About a quarter of Society members are students, with about a third practising scientists in research institutions or Universities, a third working for regional or central government and the remainder in consultancy, other education or advocacy.

Honorary & Past Members

See page 3. ■

NEW ZEALAND
Freshwater Sciences Society
MEMBERSHIP APPLICATION



How do I Join?

Print/pull out this page, fill in your details, then post to:

Janine Wech, NZFSS Secretary-Treasurer, c/- NIWA, PO Box 8602, Riccarton, Christchurch 8440

or email to: Janine.Wech@niwa.co.nz.

DETAILS:

Title..... First Name..... Middle Initial/s..... Last Name.....

Postal Address.....

.....

Email.....

Telephone: (main)..... (alternate).....

Membership Type: (select one) ☐ Waged ☐ Student ☐ Unwaged

Brief list of your professional interests:.....

.....

.....

PERMISSIONS: (Please select your preferred option for the following and sign to authorise)

I agree to the NZ Freshwater Sciences Society **publishing my membership details**:

☐ Yes ☐ No Signature.....

I give permission for my **email address to be added to the NZFSS email mailing group**:

☐ Yes ☐ No Signature.....

My preferred format for **receiving the NZFSS newsletters** is:

☐ Hardcopy ☐ PDF – via email Signature.....

PAYMENT: (Please select appropriate boxes)

☐ Waged/Corporate \$55 per annum ☐ Unwaged/Student \$15 per annum ☐ Life Membership \$1375

☐ Donation to the SIL Trust* (optional) \$4

Total Amount \$.....

☐ **Payment by Cheque** – Make payable to “NZ Freshwater Sciences Society”

☐ **Payment by Direct Credit** – Acct: BNZ 02-0700-0354213-00 (include your last name in the Reference/Details field)

Date paid.....

☐ **Payment by Credit Card** (please tick one) ☐ Visa ☐ Mastercard

Name on Card..... Card Number.....

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Please send completed form to: NZFSS Secretary-Treasurer (details at the top of this form).

* The SIL 1987 Trust supports overseas travel awards for beginning NZ scientists and guest lecturer visits to NZ by eminent international freshwater scientists.
See www.freshwater.science.org.nz for more details.



Shelley McMurtrie from EOS Ecology
showing students inaka eggs in
temporary spawning habitat.

Photo © EOS Ecology



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