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NEW ZEALAND  
Freshwater Sciences Society

# NEWSLETTER



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MAIN COVER PHOTO:

Waimakariri River. Photo © @shannan\_crow

COVER LOWER PHOTOS:

LEFT: Brandon Goeller (PhD student) and Will Keay (summer student) pumping shallow groundwater samples from a woodchip denitrifying bioreactor to evaluate its performance in reducing nitrate-nitrogen loading to a small agricultural waterway in lowland Canterbury. See article on page 17.

Photo © Angus McIntosh

2nd FROM LEFT: Kirsty Brennan from EOS Ecology with students on a field trip to a local waterway. See article on page 39.

Photo © EOS Ecology

2nd FROM RIGHT: Surveying kōkopu on Rēkohu. See article on page 8. Photo © Te Kawa Robb

RIGHT: Children from the Oxford Playcentre group helped translocate kōwaro (Canterbury mudfish) to a wetland, as part of the Kids for Kōwaro project. See article on page 49.

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# 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 2017 subscription is \$55.00 per annum; or \$15 for students, the unwaged, or retired persons. Committee members for 2017 are:

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2000–12 Dr B. Sorrell  
2012–16 Ms J. Wech

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2007–09 Dr N. Philips  
2010–12 Ms H.J. Rainforth  
2012–16 Mrs K. Doebling ■



# EDITORIAL



Kia ora koutou,

Another busy year is nearing an end—much more quickly than I would like! It's been good to see freshwater news and issues receiving even greater attention over the past year, with many NZFSS members making important contributions to the national discourse. One thing is becoming increasingly clear—interest and engagement in freshwater seems to be growing

at all levels. An important part of this increased engagement is making freshwater science accessible to local communities, and many new and innovative ways of communicating freshwater issues are now being used both nationally and internationally. Recently, two novel communication methods caught my interest.

A student exhibition at Nelson Museum used artistically designed 'fish' to highlight changes in water quality, and thereby oxygen content, in a local stream. Water temperature monitors were installed in the stream, and linked (via a server) to acrylic fish that were decorated with LED light arrays and displayed in the museum window. Each fish related to a specific water temperature monitor located in the stream, and the colour of the lights on each fish changed as water temperature changes were detected. A relatively simple concept, but a clear and accessible way to bring attention to changes in stream water quality.

In another innovative project, design students from New Taipei City used 'ice-blocks' to raise awareness of water contamination issues. Their project involved collecting water samples from urban rivers, streams and ports around Taiwan, and freezing these in ice-block shaped moulds. The moulds were then preserved in resin and put on display. The resulting 'ice-blocks' paint a clear, and sobering, snap-shot picture of the health of the waterbodies they were collected from,

showing huge variation in water clarity, suspended solids and even general detritus, such as plastic litter, in the water samples. The aim of the project was to inspire people to make changes to their lifestyles to help reduce pollution.

Both projects are great examples of effective, visual communication tools that connect and raise the awareness of water quality issues to the wider community. It will be interesting to see if tools like these are used more widely, and what actions may be inspired as a result. I look forward to seeing what other innovative communication methods are developed in the future to engage communities with the wide range of freshwater research being carried out throughout the country.

On to communication of a different kind—this year's newsletter! As always, it is filled with many interesting articles and project updates, and I'd like to thank everyone who contributed. I've enjoyed reading about all the research and projects underway, and hope you all enjoy the newsletter. Last, but by no means least, a big thanks to Marine Richardson, our new assistant editor, and Bronwyn Gay, layout and design, for all their help and hard work—in particular, to Marine for all the contribution wrangling, and Bron for bringing us another fabulous layout. This newsletter is certainly not something I could tackle alone!

Ngā mihi nui, nā

Natasha Petrove

NEWSLETTER EDITOR ■

 [www.stuff.co.nz/nelson-mail/news/94442826/art-meets-science-in-student-exhibition-at-nelson-museum](http://www.stuff.co.nz/nelson-mail/news/94442826/art-meets-science-in-student-exhibition-at-nelson-museum)

[www.theguardian.com/cities/gallery/2017/sep/01/popsicles-pollution-ice-lollies-taiwan-taipei-contaminated-waterways](http://www.theguardian.com/cities/gallery/2017/sep/01/popsicles-pollution-ice-lollies-taiwan-taipei-contaminated-waterways)

# PRESIDENT'S PIECE



I am writing this while New Zealand is 11 days from the date of its general election. In contrast, by the time you will be reading this, the election will have passed and we will be well into our next government's term. While the election race is very tight and there's no telling

who will form the next government, one thing that this election has made abundantly clear is that water issues are amongst the biggest concerns for New Zealanders. It's been incredible to see how swimmability, irrigation, water pollution, and other water issues have been at the forefront of political discussions, debates and analysis. This has never happened before. So, as freshwater scientists, managers and interested parties, all NZFSS members will be aware of the strong social relevance of their work on freshwaters, whatever their work may be. It's fantastic for us personally and for our Society to be in such a position of public interest and I hope that you are all feeling how worthwhile your freshwater work is for the country.

Some of the key events related to freshwater issues in the past year have included:

- The rejection of the contentious Ruataniwha dam proposal by the Supreme Court.
- The Whanganui River was bestowed the rights, duties and liabilities of a "legal person" under New Zealand law. Whanganui Māori successfully argued that the river is an ancestor and therefore a legal person. This is a world first for a river.
- The publication of the 10-yearly OECD environmental performance review for New Zealand.
- The publication of the Prime Minister's Chief Science Advisor's (Sir Peter Gluckman's) report on the state of New Zealand's freshwaters.
- The publication of the Ministry for the Environment's Clean Water Package which included new goals to be achieved for swimmable rivers and lakes.
- The establishment of a coalition of NGOs and industry groups and its development of a Freshwater Rescue Plan for New Zealand.
- John Hayes (Cawthron Institute) was awarded the NZFSS Medal for 2016 for his services to advancing freshwater science – congratulations John!
- Mike Joy (Massey University) won the Inaugural Critic and Conscience of Society Award bestowed by the Gama Foundation. This award includes a \$50,000 prize to facilitate Mike's work. Congrats Mike!

I found the OECD performance review to be particularly interesting and insightful and I encourage you to read it if you haven't already done so. Simon Upton (former Minister for the Environment in Jim Bolger's Government) was the lead author of the OECD report and he is due to take over as the Parliamentary Commissioner for the Environment after Jan Wright's term ends later this year.

The above items highlight that it's been another interesting and exciting year for freshwater issues and science. It's great to see many of our members promoting these issues to the public via the mass media and other avenues of dissemination.

## NZFSS ACTIVITIES IN THE PAST YEAR

Along with planning our joint 2017 conference in Hamilton with the International Society for River Science, below is a list of some other activities that the NZFSS Exec has carried out in the past year on behalf of the Society:

- Rebuttal of, and engagement in the media surrounding, Prof. Jacqueline Rowarth's comments on the state of the Waikato River.
- Detailed submission on MfE's Clean Water 2017 package, and engagement with the media on issues surrounding the swimmability standards and goals.
- Submission on the Department of Conservation's draft Threatened Species Strategy.
- Letters of support for the proposed Indo-Pacific Fishes Conference 2021 in Auckland and the proposed 2020 INTECOL Wetlands conference in Christchurch.
- Migrating our website over to a new platform with a new design.

If you are interested in reading our submissions you can access them on the NZFSS website ([freshwater.science.org.nz/index.php/bulletin-board/#submissions](http://freshwater.science.org.nz/index.php/bulletin-board/#submissions)). Note that this URL will change shortly when the new website goes live.

## THE NZFSS CASH RESERVES – AND WHAT TO DO WITH THEM

As discussed at the last AGM, the Society is accumulating a large reserve of cash and many members have expressed concern that we are not investing some of this reserve to help accomplish the Society's goals. We have collected many good ideas as to what could be done with the reserves and, once the new website and forum goes live, we will set about working with the membership to prioritise projects and determine what an appropriate amount of cash reserve should be for the Society. At the AGM we will present a draft plan for spending some of these reserves, which we will seek support from the membership to carry out in 2018.

## CLOSING MESSAGE

The NZFSS has benefitted greatly from the skills and energy of people on the Executive Team and by many members of our Society who assist with our various functions (for example, writing submissions). This past year in particular, we have been assisted greatly by members at large in putting together our submissions. In particular, we would like to thank NZFSS members Keith Hamill, Chris McBride, John Quinn and Susie Wood for their help. I would like to specifically thank these NZFSS executives and assistants for their help so far this year: Richard Allibone (submissions), Lisa Carlin (website admin), David Hamilton (submissions), Phil Jellyman (submissions), Kate McArthur (submissions), Bronwyn Gay (newsletter), Natasha Petrove (newsletter), Marine Richardson (newsletter) and of course our omniscient chief organiser and keeper of accounts, Amy Whitehead (Secretary).

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 the joint conference in Hamilton in November,



Marc Schallenberg

PRESIDENT, NEW ZEALAND FRESHWATER SCIENCES SOCIETY ■



Freshwater community volunteer, Dr. Anna Paula Rodrigues,  
in borrowed (over-sized!) waders, helping to collect  
Canterbury mudfish larvae for Working Waters Trust.

Photo © Sophie Allen

## INVITED ARTICLES & OPINION PIECES





# A Walk in the Waders of a Community Volunteer

By Sophie Allen – NZFSS Community Outreach committee member

We all love the idea of a community chipping in together to do good. However, all too often community groups are expected to carry out this 'do good' work voluntarily. Working for a charitable trust that aims to foster community-led freshwater projects, I've seen what it's like to walk in the shoes (or, more appropriately, wade in ill-fitting waders) of a community freshwater volunteer. I think it's time for us all to take a splash around in some borrowed waders.

Around Aotearoa New Zealand there is a building call from many communities who are passionate about their waterways for a greater role in management, and for recognition of the expertise that only they can provide. Alas...many currently feel they are disempowered and locked out due to an unequal playing field.

A recent case that really highlighted this gross lock-out of community were the criteria for the first round of the \$100 million Freshwater Improvement Fund. With a threshold requirement of at least \$200,000 in co-funding, this excluded virtually all community-led applications from even getting off the mark. Communities may feel that not only are they are running uphill, but also towards endlessly shifting goalposts.

So, what does this call from our communities for empowerment have to do with freshwater scientists and resource managers, you might be asking? You might be thinking this is all in the hands of the government, fund managers, or private landowners, right?

I argue that we, as members of NZFSS, have a moral responsibility to help level that playing field for communities to be involved in research and management of our freshwater resources.

But how? It pays to dive into where the inequity is coming from – not just from funding differences, but also perhaps from our own prejudices:

- We tend to undervalue community input and knowledge. I've been helped immensely whenever I've just taken the time to ask. A simple shout-out in the Golden Bay Weekly saved me hours of stream wading in a search for the rare *Echyridella onekaka* freshwater mussel.
- We usually do not factor in enough real quality time to connect and work with a community. It should not be just a 'nice-to-have'. Communities have a right to be involved and kept informed, particularly for tax-payer funded research.
- Community groups are often passionate and in for the 'long haul'. They can handle more ambiguity and uncertainty with their less-structured, organic forms of organisation. However, this ability gets mistreated sometimes, and I've observed that they are unknowingly 'selling themselves short'; committing to take on too much and not realising the true value of what they are achieving.

## SO WHAT COULD WE DO BETTER?

- Recognise that volunteers can be well-informed, and with extensive expertise. A community volunteer felt she had to vent her frustration in an event earlier this year where a senior council staff member was speaking about 'volunteers vs. professionals.' She passed me a note with the simple statement 'volunteers can be professionals too!'
- Keep the local community up-to-date about how research or a project is progressing. Really make an effort and give your time in allowing for discussion.
- Be compassionate of what you ask a community member to undertake. Community members often selflessly volunteer their time. However, imagine sitting at an important meeting, and realising from looking around the table that you are the only one not being reimbursed for your contribution. One stalwart community volunteer, working 40+ hours a week, recently commented to me 'they just don't get it. I'm lucky if I get a free lunch.'
- Recognise and celebrate community input financially or with other rewards, so that no one is taken for granted. Consider funding koha for helpers, and include roles for locals and community groups to get involved in projects.
- Support more protective measures, i.e., 'a stitch in time, saves nine.' Even though not as glamorous and media-grabbing, communities are good at valuing protection of what they have. Maybe because they can picture what it would be like to lose their valuable resource. This is in contrast to 'the ambulance at the bottom of the cliff scenario', resulting from our current economic free-market model; where it is financially more rewarding to allow a problem to develop and then pay more to fix it.

With a charge on irrigation water currently floated by the Labour Party to create a potential new funding stream for waterway protection and restoration, is this when we could help usher in an era of more community-led catchment management, such as the NGO-led watershed programmes for Canadian lakes?

As the co-opted 'Community Outreach' member on the NZFSS Committee, I've been pondering over the exact term of 'outreach'. It suggests that there is an 'us' and a 'them' to reach out to. In reality we are all part of our communities. Time to start changing our mindset to 'he waka eke noa – we are all in this together.' ■

# Ngā mahi o te rōpū Māori

By Ian Kusabs & Tara McAllister

Tēnā koutou katoa,

I te tuatahi ka tika me mihi ki ngā kairangahau Māori me ngā hāpori Māori i ngā pito katoa o tēnei motu e mahi ana ki roto i ngā awa hei whakaora hei tiaki hoki tō tātou wai Māori.

We would firstly like to acknowledge all the hard mahi that our Māori researchers and Māori communities have been conducting all over Aotearoa/New Zealand, and highlight some of the awesome mahi that our kairangahau Māori are doing throughout Aotearoa.

## Rēkohu – Chatham Islands Wānanga

### Ian Kusabs

In March this year, I attended the Ioranga Pūtaiao (Giving Back) wānanga on Rēkohu hosted by the Hokotehi Moriori Trust (HMT). The HMT trust represents Moriori on Rēkohu and its people would like to become more actively involved as the kaitiaki of the Islands' unique freshwater ecosystems. Rēkohu ('misty skies') is a unique landscape, both in New Zealand and international terms. Rēkohu has a long geological history, allowing a high degree of endemism to develop (i.e., plants and animals that only exist on the Islands). Despite its small size and relatively low topography, Rēkohu has a diverse range of freshwater environments, including streams, rivers, lakes, wetlands, underground (cave) streams, and a large coastal lagoon (Te Whanga).

Over 30 scientists and researchers from various professions volunteered their time and expertise to assist

with discussions on freshwater quality, freshwater/estuarine fisheries, pest eradication, re-vegetation and tchiekitanga (kaitiakitanga). We also spent time with Te One and Kaingaroa schools carrying out fish surveys and monitoring stream health (SHMAK monitoring).

One of the most interesting aspects of Rēkohu is that it is trout-free (despite several attempts in the early and mid-1900s to establish brown and rainbow trout). Galaxiids seemed to be everywhere, with small schools of sub-adult (70–100 mm TL) banded and giant kōkopu observed swimming around in broad daylight. The size of the giant kōkopu was particularly impressive; we captured one that was approximately 330 mm in length. Given the large size of the galaxiids on Rēkohu, mini-fykes should be used instead of minnow traps (as we soon found out) when sampling stream habitats.

Also of interest were the smelt that we captured in Lake Pateriki. These smelt were originally thought to be a separate species endemic to Chatham Island (*Retropinna chathamensis*), but were later confirmed to be common smelt (*Retropinna retropinna*). However, physiologically these are the hardest common smelt I've ever come across. The Kaingaroa School pupils, all five of them, measured 95 smelt and returned all back to the lake without a single mortality!

Te Whanga lagoon is a particularly impressive and highly productive coastal lagoon, it is approximately 18,600 hectares in area and makes up approximately 20% of the island's total area. Te Whanga is considered to be one of the



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least-modified coastal lagoons in New Zealand. It provides an extensive wetland habitat, supporting a diverse range of water and wading birds, and freshwater and marine fish and invertebrate species. Because the water is strongly saline, species of typically marine fish (e.g., leather jacket, garfish) and shellfish (e.g., mussels) which gain access to the lagoon can survive for extensive periods of time. Te Whanga Lagoon has been highly valued as a place to collect mahinga kai since Rēkohu was first settled by Moriori. Even today it is still known as the food basket (especially for tuna and patiki) of the island. To give some idea of its productivity, we set one fine mesh fyke net in Te Whanga and captured more than 400 estuarine triple fins and ten litres of freshwater shrimp!

I've left six fine mesh fykes, 12 fine-mesh 'Gee' minnow traps, and six mini fykes (John Hollows design) with the HMT, so if you're heading to Rēkohu please consider hiring (at a minimal rate) the sampling equipment from them (office@kopinga.co.nz). Not only will this save money (air freight is expensive), but it will also help prevent the accidental spread of pests to Rēkohu. In addition, it will also enable contact with the kaitiaki who are very keen to be involved in any environmental research or monitoring on Rēkohu in the future.

## Te Reo o Te Repo – The Voice of the Wetland, a cultural wetland handbook

**Yvonne Taura, Cheri van Schravendijk-Goodman & Beverley Clarkson**

Te Reo o Te Repo – the Voice of the Wetland, was released as an online resource in February 2017. As Aotearoa New Zealand has lost more than 90% of original repo (wetlands), Māori are becoming increasingly concerned about the mauri (life force) of this culturally significant ecosystem. They have also struggled to have their voices heard within wetland management.

Through the Wetland Restoration Programme (C09X1002), Manaaki Whenua – Landcare Research and Waikato Raupatu River Trust (WRRT) co-designed, co-developed, and co-implemented a variety of projects that worked towards the restoration of repo throughout the Waikato rohe (region). As part of the programme, Manaaki Whenua and WRRT produced the online cultural wetland handbook, collating best practice restoration techniques from throughout Aotearoa to increase the health and well-being of repo.

The handbook highlights a range of mahi (work) undertaken by whānau (families), hapū (subtribes), and iwi (tribes) and includes processes for facilitating renewed and vibrant connections between whānau and their repo, understandings of cultural resources, and learnings from case studies on repo restoration, cultural indicators, and monitoring. The handbook aims to enhance and protect cultural wetland values to share with tangata whenua (indigenous people) throughout the motu (Aotearoa), and to assist other members of the public to understand the cultural priorities for repo restoration.

But, most important, Te Reo o Te Repo is about sharing stories with each other. The articles in the handbook are a small sample of research, contributed by kairangahau (researchers) from all over the motu. From Northland to



Bev and Yvonne with the handbook.

the Deep South, tangata whenua, and kairangahau Māori and non-Māori are working together to enhance and protect cultural values of repo. Several members of the Freshwater Māori rōpū (group) have contributed articles to the handbook. Many articles discuss the personal journey taken by kairangahau and the whānau involved to promote the connections, understandings, and learnings for the restoration of repo in their rohe.

The online handbook is intended to be a living document. We hope to receive additional stories from across the motu, so that future editions can continue to be relevant and appeal to the next generation of kaitiaki (guardians), kairangahau, and environmental leaders.

Make sure to check the online resource at [www.landcareresearch.co.nz/te-repo](http://www.landcareresearch.co.nz/te-repo). Articles about Te Reo o Te Repo can be found in both Te Hookioi – Waikato-Tainui tribal magazine, and Discovery – Manaaki Whenua bi-annual newsletter. It also supports and enhances the Wetland Restoration Handbook 2010.

Mauri Ora!



## Te Kūwaha & partnerships

*Te Kūwaha are NIWA's Māori Environmental Research Rōpū*

### CULTURAL KEYSTONE SPECIES: CO-MANAGEMENT AND RESTORATION: AN OVERVIEW

*Cultural Keystone Species: Co-management and Restoration* (CKS2020) is a four-year programme (2017 to 2020) that builds on the freshwater taonga species research that NIWA has been undertaking over the last six years with our partnerships across Aotearoa-NZ.

The wellbeing of whānau has long relied on the sustainable use, conservation and management of freshwater resources, where taonga species like tuna, kōura (kēwai, freshwater crayfish) and kākahi (kaeo, freshwater mussels) once sustained local and regional economies with significant food and resources. These species are also vital for maintaining ecosystem integrity and function, and their cultural and ecological importance characterises them as Cultural Keystone Species (CKS). Given these species play fundamental roles in Aotearoa-NZ's socio-ecological and freshwater ecosystems, the overarching hypothesis of this programme is that the recognition and prioritisation of CKS in co-management, restoration and monitoring will help sustain social, economic and ecological health and wellbeing.

CKS2020 is a series of coordinated interlinked studies occurring at different places around Aotearoa-NZ. CKS2020 comprises four themes: 1) Understanding and maximising the survival of juvenile CKS life stages; 2) Understanding the influence of multiple stressors and cumulative effects on CKS populations; 3) Developing approaches to assess and communicate state and trends in CKS populations; and 4) Developing interdisciplinary decision-making frameworks that value and support CKS populations.

### CULTURAL KEYSTONE SPECIES: WAIRUA RIVER ELVER SURVEY 2017

For the first time in Aotearoa-NZ, a catchment-scale approach is being implemented to examine variation in juvenile eel survivorship in riverine habitats. Electric-fishing surveys at 51 sites were used to investigate whether previous elver releases (i.e., stocking density), from a manual trap-and-transfer programme operating at the Wairua dam, is correlated with the abundance of elvers now observed at sites in the Wairua River catchment, Northland. This survey work is the foundation of a multi-year sampling strategy to investigate how well elvers are surviving and growing in the different habitats they have been transferred into. Surveys over the next four years will monitor eel populations in selected streams to increase our understanding of the drivers influencing elver density in different habitats.

### WHAKAORA TE WAIHORA: FISHERIES PRODUCTIVITY & RECRUITMENT

In 2016/17, NIWA completed the Whakaora Te Waihora co-funded project called 'Fish restocking/recruitment including a review of fisheries management'. In 2016/17 the CKS team produced five reports that target research

objectives developed by Te Rūnanga o Ngāi Tahu (TRoNT) and Environment Canterbury (ECan) for Te Waihora. These reports have collated all existing fisheries data for Te Waihora into a single database for TRoNT; identified factors limiting mahinga kai recruitment; examined fishery productivity of key mahinga kai species from throughout the lake; assessed the effectiveness of protected or enhanced environments for mahinga kai species and their prey; and determined the effectiveness of the establishment and enhancement of kōhanga areas (i.e., areas where commercial fishing is prohibited) in protecting mahinga kai species. The results of this project will help TRoNT, ECan and Te Waihora papatipu rūnanga effectively manage and monitor customary fishery resources in Te Waihora.

### NGĀ KETE O TE WĀNANGA: MĀTAURANGA MĀORI, SCIENCE & FRESHWATER MANAGEMENT

The MBIE-funded Ngā Kete o Te Wānanga (NKTW) research programme, co-led by Dr Jane Kitson, Dr Gail Tipa and NIWA is already having an impact for our partners, particularly in terms of: 1) the engagement of case study rūnanga in management processes, 2) influencing the need to cross artificial boundaries in management agencies, and 3) transferring the approaches developed in this programme to other collaborative partnerships/freshwater management contexts. A brief update about what's happening in the Murihiku and Waitaki-Opihi research tasks is provided below.

### Murihiku Partnership: Update 2016/17

The Murihiku case study is testing the hypothesis that a Murihiku Cultural Water Classification System will identify synergies between mātauranga Māori and science in freshwater monitoring to establish baselines that empower the role of mātauranga Māori in freshwater management. A mixed methods approach is being applied, including cultural value mapping, wānanga, hikoi/field studies, interviews and literature reviews, to identify and monitor appropriate attributes and indicators to describe the state of the health of Murihiku cultural values at significant sites along the Te Koroka pounamu trail. The development of this classification system requires mana whenua to source historical information, engage the expertise of their own knowledge keepers, revitalise the relationships of the current generations with their cultural values and sites of importance, identify a suite of appropriate attributes, indicators and methods, and develop analysis tools that bring knowledge systems together to communicate the state of their cultural values. In NKTW the archaeological and historical information collated by Ailsa Cain (Kauati Limited) has been carefully revitalised and reconstructed to inform the design and implementation of a culturally-robust monitoring programme that is underpinning the Murihiku Cultural Water Classification System.

Waitaki-Opihi Partnerships:  
Update 2016/17

The central hypothesis for the Waitaki-Opihi case study is that scenario planning has the potential to enable Māori perspectives and mātauranga Māori to more effectively inform freshwater management. This report considers a so-called 'Historic Scenario' that is intended to reflect some of the important reference points for Māori with the aim to increase their engagement in freshwater decision making. Understanding the reference state is essential, as mātauranga describes a cultural reference condition that hapū and whānau are likely to want to reconstruct.

Within Ngā Kete o Te Wānanga, rock art is being tested as an exemplar for land-based taonga that are potentially impacted by freshwater management/decision-making.

Currently there is little or no recognition of, or mechanism to address, the vulnerability of land-based cultural sites of significance in regional planning processes in relation to land and water use activities. Using hikoi and hui we have drawn upon mātauranga Māori and hydrogeology to develop a freshwater-focussed sensitivity mapping approach which will serve the preservation of sites and their associated freshwater ecosystems.

**For any Māori freshwater scientists, researchers or students who would like to join the NZFSS Māori rūpū, please email [māori.fwss@gmail.com](mailto:māori.fwss@gmail.com)**

**Ngā mihi maioha, nā  
Ian Kusabs rūau ko Tara McAllister**

MĀORI REPRESENTATIVES, NEW ZEALAND FRESHWATER SCIENCES SOCIETY ■

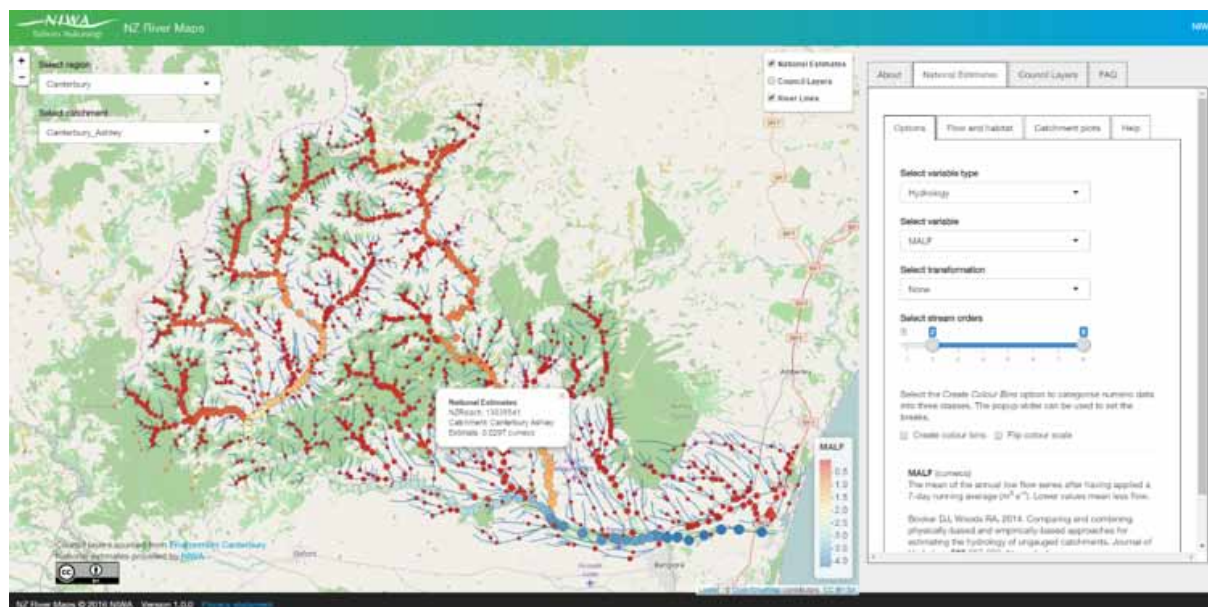
## NZ River Maps Available Online

By Amy Whitehead – NIWA

**NZ River Maps is a simple, yet flexible, web-based tool that allows users to map a range of spatial data, including national estimates for over 108 freshwater variables predicted by NIWA and publicly-available council planning layers.** Current national estimates data include metrics describing hydrology, river width, bed sediment, fish distributions and habitat, bird habitat, invertebrate indices, water quality, suspended sediment loads, and cumulative allocated water consents. The tool enables users to visualise

how data are spatially distributed, as well as generating summary plots and statistics. We envisage that NZ River Maps might be used by planners and environmental staff from various councils and agencies, as well as special interest groups, to explore regional patterns in a range of freshwater metrics. These data may contribute to regional planning, inform community consultation processes and help identify areas of interest that may require further investigation. ■

🌐 <https://shiny.niwa.co.nz/nzrivermaps>



Screenshot of NZ River Maps showing the predicted mean annual low flow for the Ashley River catchment in Canterbury.

# A Plea for More Cost-effective State of the Environment Biomonitoring

By John Stark – Stark Environmental Limited

**The state of New Zealand's freshwaters has received a great deal of media attention recently. Regional councils are required, under the Resource Management Act, to monitor river health and all have now implemented State of the Environment monitoring programmes that involve the collection of macroinvertebrate samples (amongst other things) at least once per year. The number of sites varies between regions, as do the sample processing protocols used and the nature of other field data collected at the same time.**

I have always been an advocate of cost-effective biomonitoring. After all, collection and processing of macroinvertebrate samples (and other environmental data) is not cheap, so I think it makes sense to collect only what meets the data requirements and needs of water managers.

In recent years there has been a trend towards collection of quantitative data – driven I suspect by scientists whose focus may be more on the needs of their research programmes than the needs of the water management industry. If you could convince someone else to pay for the collection and processing of macroinvertebrate samples, and you could acquire the data subsequently at little or no cost, why wouldn't you? One could be forgiven for thinking that some water managers really don't know what information is critical to their decision-making, but rely on advice based on the source, rather than whether it really makes sense or not.

I take a different view. Most councils base their SOE reporting on the Macroinvertebrate Community Index (MCI), which requires only presence-absence data. I contend that a widespread MCI-based surveillance programme is the most cost-effective means for a council to gain an overview of river health in its region and to identify areas that require further investigation or could warrant remediation. Imagine how quickly (and cheaply) samples could be processed if the data required was simply a list of macroinvertebrate taxa present. It's the counting that really takes the time. Some of the time saved by not counting animals could also be used to take identifications to the best practical level (rather than just to the (mostly) generic level required by the MCI).

There is already a plethora of quantitative or semi-quantitative macroinvertebrate data available in most regions of New Zealand – well over 20 years in many cases – so I believe the time is right for councils to adopt more cost-effective methods so that they can increase the number of sites in their SOE biomonitoring programmes within existing budget and time constraints. In my view, more expensive quantitative methods should be reserved for biomonitoring of significant consents, for investigating sites where SOE biomonitoring indicates stream health may be lower than desired, or for well-designed targeted research programmes for investigating specific issues. Given the cost of data collection, I do not believe it is acceptable to collect information simply because it might be useful one day, or to collect information that

is not used at all (except perhaps to make a report appear more impressive). Any data that are collected should meet a need that is demonstrable and immediate.

The other issue that concerns me regarding SOE monitoring is the concomitant collection of other data (e.g., habitat data or stream stability assessments). Some of these protocols are very time-consuming, have considerable subjectivity, and (quite often) the results do not change much from year to year. I do not believe that these assessments need to be done every year. Often, when they are, they serve to prolong the period over which macroinvertebrate samples are collected (over four months in some cases), or they reduce the number of sites that can be sampled per day (e.g., to three or fewer in many cases). This means that the samples are collected under markedly different conditions and are not necessarily comparable with one another. It should be possible to collect a macroinvertebrate sample and take a few site photos by spending well under 30 minutes on-site.

*(Note: I am not referring here to water quality monitoring, which is an entirely different matter involving a quite separate programme with a different sampling strategy.)*

Macroinvertebrate biomonitoring is founded on the premise that macroinvertebrate communities are a product of their environments. It is, therefore, not necessary to measure everything you can think of at each sampling site on every sampling occasion. The focus should be on data that has an immediate value for water management. Many studies have examined the relationships between macroinvertebrate community composition or species presence-absence and the features of the environment that influence them. In general terms, the kinds of stresses that produce 'undesirable' biological growths (including macroinvertebrates) are well-known. Consequently, I believe that annual SOE biomonitoring should focus primarily on sampling macroinvertebrates within each region during a period of a few weeks at most. The areas of concern should be able to be determined by examining some decent site photos and the macroinvertebrate data alone. More extensive sampling of other features of the environment should be undertaken less often or (preferably) only when further investigations are required to determine the reasons for substandard river health.

I believe that what I am suggesting is a responsible, common-sense approach that makes best use of limited resources—not only the rate-payers' money that funds the work, but also the limited time of council staff and the laboratories that process the samples. Surely, it is better to sample more sites to gain a better overview of river health in the region than to do more intensive investigations at fewer sites? At sites where river health is very good or excellent why do more than document it in the most cost-effective way possible? To do more than that could be viewed as a waste of resources that otherwise could be used to improve river health at sites where river health is substandard. A cost-effective MCI value and an alert field team (or some good site photos) can easily help pinpoint those places. ■



Alex Barclay (MSc student) D netting for invertebrates  
in a tarn near Three Tarns Pass (1720 m), Lewis Pass.  
See article on page 17.

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Photo © Richard White





# STUDENT NEWS



Emma Moffett



Tom Moore

Hi NZFSS students,

The NZFSS has two new student representatives this year, Tom Moore at University of Waikato and myself – Emma Moffett – at The University of Auckland. As your representatives we can report back to the executive committee with any comments, queries, or improvement ideas, and what you think is working well. Students play an integral role at conferences, presenting a lot of new ideas and often yet to be published data. If you do have any feedback you can approach us in person at the conference or by e-mail.

The conference in Hamilton looks like it is going to be great, with a massive diversity of topics and lots of international speakers too. For us students we will have a student function on Tuesday the 21<sup>st</sup> of November at the new bar right across the road from the conference venue (so convenient!). This will be a good chance to meet your fellow students in a more casual setting with a free drink and some food.

We hope all of your data collection and analysis is going well and look forward to meeting you all.

Emma Moffett & Tom Moore  
STUDENT REPRESENTATIVES  
NZFSS COMMITTEE ■



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# CRITTER OF THE YEAR 2017

By Karen Shearer

## *Potamopyrgus antipodarum*

New Zealand's boring, common & innocuous mud snail...or is it???

The amazing freshwater animal I'm going to tell you about this year is a supervillain, whose interests include eating detritus, algae and sediment; reproducing (usually asexually) to attain phenomenal densities; and international travel where they're generally cluttering up the place. The world gave us rock snot, koi carp, mosquitofish and hornwort, but don't worry folks, we returned the favour with the New Zealand mud snail – *Potamopyrgus antipodarum*! Yes...our little ray of native snail sunshine is considered an exotic pest – noxious even – taking over the waterways of Europe, North America, Asia, Australia and even Iraq! So far it hasn't made it to Iceland, but I'm sure it's planning a trip. Turns out our wee snail is one of only two animal species I could find that we have inadvertently sent out to invade the world – the other animal being a flatworm that has raided Europe feeding on their earthworms and generally degrading the soil quality... woop woop!

So what's the real deal behind our little aquatic rebel? Who exactly is this *Potamopyrgus*?

Constructed from the Greek language 'potamo' means river, 'pyrgus' is tower, and 'antipodarum' simply means from the antipodes. A 'river tower from the antipodes' – good start if you're planning to strike fear in the waterways of the world! Interestingly, John Edward Gray, a prominent zoologist of the nineteenth century, initially labelled the mud snail *Amnicola antipodarum* in 1843 (didn't stick because 'river cultivator from the antipodes' sounded like our snail was going to take over the world with a rotary hoe).

Despite being commonly called a mud snail, *P. antipodarum* can be found on the single level and subbasement dwellings of clean cobble riverbeds in slow-flowing pools and margins, and inhabiting the high rises of lake macrophytes growing up towards the light. They can also be commonly found in trout guts – generally indicating you're wasting your time with the fly rod as the trout are heads down, and bottoms up...benthic-browsing and unlikely to see anything you're going to drift past them!

Like all good supervillains *P. antipodarum* has many tricks up its mantle. They can cope with siltation, pastoralisation, urbanisation, salinities of 0–15 ppt, and temperatures ranging from 0–34°C. This small innocuous snail is capable of taking on several different disguises (morphs) including growing spines on their shell periostracum – a fancy-pants word for 'the thin organic coating which is the outermost layer of the shell'. Throw that one round at a party and see how many friends you have at the end of the night.

After eons of evolution, *P. antipodarum* quickly acquired the one important characteristic necessary for its plan of world-wide domination – the ability to survive for up to 50 days on a damp surface. This gives them ample time to be transferred from one body of water to another via an unsuspecting carrier (probably a fisherman), allowing them to cross international borders with apparent ease. I present to you my fellow readers of entomological delights, our very own authentic aquatic guerrilla. ■



Photo © Bart Zijlstra  
[www.futurity.org/mud-snails-asexual-reproduction-1094612-2](http://www.futurity.org/mud-snails-asexual-reproduction-1094612-2)



Photo © Sea Grant Nonindigenous Species Site  
[www.dcpis.washington.edu/oidenlab/wordpress/wp-content/uploads/2013/03/Potamopyrgus-antipodarum\\_Casey.pdf](http://www.dcpis.washington.edu/oidenlab/wordpress/wp-content/uploads/2013/03/Potamopyrgus-antipodarum_Casey.pdf)

### Reference material used in article was sourced from:

Collier, K.J., Winterbourn, M.J. (Eds.). (2000). *New Zealand stream invertebrates: Ecology and implications for management*. New Zealand Limnological Society, Christchurch. 415 p.  
Winterbourn, M., Mason, K. (1983). *Freshwater Life: Streams ponds, swamps, lakes and river*. Mobil New Zealand Nature Series. AH & AW Reed Ltd, Wellington. 76 p.  
The world-wide web: [https://en.wikipedia.org/wiki/New\\_Zealand\\_mud\\_snail](https://en.wikipedia.org/wiki/New_Zealand_mud_snail)



Brandon Goeller (PhD student) and Will Keay (summer student) pumping shallow groundwater samples from a woodchip denitrifying bioreactor to evaluate its performance in reducing nitrate-nitrogen loading to a small agricultural waterway in lowland Canterbury.

Photo © Angus McIntosh

## RESEARCH NEWS



# UNIVERSITIES

## University of Canterbury Freshwater Ecology Research Group (FERG)

**New:** Simon Coats, Roland Eveleens, Alex Barclay, Channell Thoms



- **Jon Harding** continues to be busy as the Dean of Postgraduate Research. This spring he will be serving on the Special Tribunal on the proposed Water Conservation Order for Waikoropupū Springs.
- **Catherine Febria** headed to Tokyo for an author's meeting of UN IPBES Asia-Pacific Regional Assessment.
- **Simon Coats** received a competitive scholarship to support his MSc research.

Below are snapshots of some of the projects FERG have been working on over the last year.

**Invertebrate Community Composition in South Island High Alpine Ponds** – Surveying invertebrate species present in South Island high alpine ponds over altitudinal and latitudinal gradients. **Staff involved:** Alex Barclay (MSc student) with Angus McIntosh and Helen Warburton (staff).

**Mine Impacts on Freshwater Food Webs** – Examining the effects that mine drainage has on freshwater food webs, using observational surveys and modelling techniques. **Staff involved:** Justin Pomeranz (PhD student) with Jon Harding and Helen Warburton (staff), in collaboration with Ross Thompson. **Outputs:** One paper submitted, one paper in preparation.

**Mayfly Ecology** – Mayfly distribution, body size, and phylogenetic relationships across latitudinal and altitudinal gradients. **Staff involved:** Steve Pohe (PhD student) with Jon Harding, Mike Winterbourn and Sharyn Goldstien (staff). **Outputs:** Pohe *et al.* (in press).

**Stonefly Ecology** – Adult feeding, parasitism, body size and phylogeographic relationships of *Stenoperla prasina* across New Zealand. **Staff involved:** Steve Pohe (PhD student) with Mike Winterbourn. Collaborated with Sharyn Goldstien. **Outputs:** Winterbourn & Pohe (2017); Winterbourn *et al.* (2017).

**Habitat Effects on Stream Fish Stable Isotope and Mass-abundance Metrics** – Linkage of fish mass-abundance relationships and trophic metrics to land cover, species composition, and flow regimes in headwater streams. **Staff involved:** Kevin Fraley (PhD student) with Angus McIntosh, Helen Warburton and Dave Kelly (staff). Collaborated with Phillip Jellyman. **Outputs:** Two papers in-prep.



Photo © Kirsty Hogsden

Roland Eveleens (Hons student) and Alex Barclay (MSc student) teaching local outreach students how to sample stream invertebrates with kick nets at the Silverstream CAREX site in Canterbury.

### Fixing the Leaky Plumbing: Characterisation of Nitrate-nitrogen Fluxes in Small Canterbury Agricultural Waterways –

Characterisation of the magnitude and variation in nutrient export from edge-of-field and in-stream sources in small Canterbury agricultural waterways. **Staff involved:** Brandon Goeller (PhD student) with Angus McIntosh, Jon Harding and Catherine Febria (staff). **Outputs:** One paper in-prep.

**Testing & Developing Tools for Weed Macrophyte Control in Canterbury Agricultural Waterways** – **Staff involved:** Katie Collins (PhD student) with Jon Harding, Angus McIntosh and Catherine Febria (staff). **Outputs:** One paper in prep.

### How Does Disturbance History Influence the Resistance of Freshwater Invertebrate Communities to Future Disturbances? –

Investigating the response of invertebrate communities to flooding and low-flow disturbance across different disturbance histories using in-stream channels. **Staff involved:** Roland Eveleens (Hons student) with Angus McIntosh and Helen Warburton (staff).



### Improving Conservation of Canterbury

**Mudfish** – Examining the effect of future changes to drought regimes by surveying contemporary populations of Canterbury mudfish across a gradient of drought intensity. **Staff involved:** Christopher Meijer (MSc student) with Angus McIntosh and Helen Warburton (staff).

### Confluence Complexity Controls Spatial

**Patterns in Fish Assemblages** – Investigating the role of configuration of physical conditions around confluences in determining spatial patterns in fish abundance and interspecific interactions. **Staff involved:** Nixie Boddy (PhD student) with Angus McIntosh (staff). Collaborated with Phillip Jellyman and Doug Booker. **Outputs:** Boddy & McIntosh (2017). Two other papers in prep.

### Spatial Modelling of Canterbury Mudfish

**Habitat Suitability** – Investigating the drivers of Canterbury mudfish occurrence using boosted regression trees to create a spatial model of habitat suitability. **Staff involved:** Simon Coats (MSc student) with Angus McIntosh (staff) and Matthew Wilson.

### What is Delaying the Recovery of our Degraded Streams and Rivers?

– We have just started working on this project funded by the New Zealand's Biological Heritage National Science Challenge, that will develop a restoration framework for overcoming negative resistance and resilience in degraded communities. **Staff involved:** Helen Warburton, Catherine Febria, Kristy Hogsden, Angus McIntosh and Jon Harding (all staff), in collaboration with Elizabeth Graham (NIWA).

### Canterbury Waterway Rehabilitation

**Experiment (CAREX)** – CAREX kicked off its last part of a 10-year project funded by the Mackenzie Charitable Trust. Our region-wide agricultural stream restoration experiment wraps up the last set of experiments on invasive macrophytes, nutrient remediation and biodiversity. In this last year, our emphasis will be on science communication about practical solutions for rehabilitating waterways and enhancing ecosystem functions. To sign up for our newsletter, please contact [carex@canterbury.ac.nz](mailto:carex@canterbury.ac.nz). **Outputs:** [www.carex.org.nz](http://www.carex.org.nz)

### The Ecology of Temporary Streams & Rivers (new book & publication)

– Angus & Catherine contributed to two chapters in the recently released book 'Intermittent Rivers and Ephemeral Streams' – chapters 4.1 (Romaní *et al.*, 2017) and 4.7 (McIntosh *et al.*, 2017).

### Microbial Communities in Headwater

**Streams** – Catherine and colleagues from the University of Maryland published another paper on microbial biodiversity and network patterns in forested headwater and urbanising streams. **Staff involved:** Catherine Febria (staff), in collaboration with Jake Hosen and Margaret Palmer. **Outputs:** Hosen *et al.* (2017).

**UN IPBES & Fellows Programme** – The Asia-Pacific Regional Assessment is nearly complete – stay tuned!

**Staff involved:** Catherine Febria (staff). **Outputs:** UN IPBES Asia-Pacific Regional Assessment.

### Predicting & Managing Ecosystem Tipping

**Points** – Meta-analysis of food web structure across a range of stressors/disturbances in Canterbury and the West Coast regions as part of NZ Biological Heritage project on freshwater tipping points. **Staff involved:** Kristy Hogsden, Angus McIntosh, Helen Warburton, Jon Harding (staff), Kevin Fraley, Christopher Meijer and Justin Pomeranz (students), in collaboration with Michelle Greenwood (NIWA), Elizabeth Graham (NIWA), Frank Burdon (Swedish University of Agricultural Sciences), Duncan Gray (ECAN), Mike Winterbourn and Tom Moore (Waikato).

### Brown Mudfish Metapopulations

– The influence of drought on brown mudfish metapopulation persistence under global warming and land-use change. **Staff involved:** Richard White (completed PhD) with Angus McIntosh (staff), in collaboration with Pete McHugh, Doug Booker and Brendan Wintle. **Outputs:** Graduated this year, four papers published – including White & McIntosh (2017) and White *et al.* (2017) – and more on the way.

### Importance of Ecosystem Size in Freshwater

**Environments** – Lots of work being finished here on how community stability, community size structure and capacity to support predators scales with river size and the likely consequences of, for example, reducing stream size through abstraction. **Staff involved:** Angus McIntosh and Helen Warburton (staff). Collaborated with Pete McHugh, Phillip Jellyman, Hamish Geig and Ross Thompson. **Outputs:** Three papers in review. ■

Chris Meijer (MSc student) using a gee minnow trap to sample Canterbury mudfish along the Cairn Hill Stream in the Waianiwi Valley.

Photo © Angus McIntosh







Freshwater studies at the University of Otago Zoology Department cover a wide range of fundamental to applied problems, with the main foci of our work being:

- 1) anthropogenic impacts,
- 2) fish ecology, population dynamics and evolution,
- 3) evidence-based restoration and management, and
- 4) theoretical ecology.

Five freshwater science staff supervise over 20 post-graduate students, coming from diverse backgrounds and homelands, continuing our tradition of having a postgraduate melting-pot within the department.

In the past year, former students in our department have taken on high profile jobs in freshwater science. **Jay Piggott** started a new job as a Lecturer in Aquatic Biology at Trinity College Dublin, Ireland. **Tina Bayer** has returned to New Zealand from Sweden and is now working at Environment Canterbury (ECan) as a freshwater scientist. **Jason Augspurger** took up a position in the freshwater science team at the Otago Regional Council. **Michael Greer** moved from ECan to the freshwater science team at Greater Wellington Regional Council.

Our work continues to benefit from many fruitful collaborations with freshwater scientists and managers throughout New Zealand and the rest of the world. This year, the University of Otago funded the establishment of a University of Otago research consortium called 'Catchments Otago', which brings together over 40 academics from across many departments and disciplines, to develop key scientific knowledge to underpin integrated catchment management in Otago. This strategic alliance has collaborated on successful research proposals to attract new funding for aquatic research to the Queenstown Lakes region.

**Effects of Multiple Stressors in Freshwater Ecosystems – Christoph Matthaei** continues working on multiple stressors and other topics in freshwater ecosystems, and in his role as Deputy Director of the Ecology Degree Programme at Otago University. He travelled to China for two weeks in August 2017, as part of a new collaboration there with Xi'an Jiaotong-Liverpool University in Suzhou near Shanghai. This collaboration, in which Jay Piggott plays another key role, will include building a new ExStream System in China in early 2018. Jay, Christoph and their past and present graduate students are among the three finalists for the 2017 NZ River Story Award, with a story about the ExStream System, their experimental mesocosm research facility that has been used for research in NZ, Germany and Ireland, with further systems to be built in

other countries. The winning River Story will be announced at an event in Wellington on 23rd November. **Sam Macaulay** is in the second year of his PhD that investigates impacts of neonicotinoids on New Zealand's fluvial ecosystems in a multiple-stressor context. After completing several laboratory experiments, he will lead a big stream mesocosm experiment from October–December 2017. **Robin Holmes** (who's doing his PhD part-time while employed at Cawthron Institute, co-supervised by John Hayes and Gerry Closs) has been making excellent progress on his PhD during the past year, with one journal article published in 2017 and three further manuscripts nearing completion. **Megan Bogisch** is writing up the findings from her MSc project co-supervised by Christoph and Gerry Closs. Megan's project examines the potential role of irrigation races in Central Otago as habitats for fish and invertebrates during periods of low flow.

**Larval Ecology & Population Dynamics of Native Fishes – Gerry Closs** and his lab continue to work primarily on the early life-history of native fishes, with a particular focus on how this life stage influences the population dynamics of various species. In particular, current projects focus on the larval ecology and recruitment sources of banded kōkopu, giant kōkopu and inanga in the lower Waikato River (**Matt Jarvis**, working with Bruno David and others at the Waikato Regional Council, and Kevin Collier at University of Waikato); the early life-history and population dynamics of kōaro in the Otago Lakes and West Coast regions (Jason Augspurger and Matt Jarvis); and the early life-history and stock structure of bluegill bully (**Manna Warburton** and Matt Jarvis). **Mahsa Toorchi** continues her work on the role of migratory fish and lakes in determining the distributions of non-migratory galaxiids in Otago and Canterbury.

**Estuary & Wetland Ecology –** Several projects are currently examining the fish communities of estuaries and wetlands in the Otago/Southland regions under Gerry Closs's supervision. **Fasil Taddese** is part way through his PhD examining spatial and seasonal variation of fish communities in intermittently open/closed and permanently open estuaries. **Rose Holloway** has recently joined the research group, and is currently in the preliminary stages of a similar PhD project examining the seasonal and spatial variation in wetland fish communities in the Southland region.

**Trout Ecology & Management** – This project involves the ecology and management of game species in the Otago region, particularly brown trout. **Pavel Mikheev** continues his PhD work examining the population dynamics of migratory and non-migratory populations of brown trout in the Taieri catchment. **Jeremy Xu** is also currently processing lab samples for his MSc project examining the response of rainbow trout to low flows in the Cardrona river. **Outputs:** Conference presentation at the SEFS10 (10th Symposium for European Freshwater Sciences) in July 2017.

**Enhancing Health & Resilience of New Zealand Lakes – Understanding How Multiple Stressors Affect Ecological Resilience & Integrity in Lakes** – As part of a University of Waikato-led MBIE research programme, **Marc Schallenberg** has been analysing published datasets for lake attributes that confer resilience to stressors, mainly related to eutrophication. These attributes are significant co-variables that explain residuals in empirical pressure-response relationships, such as the presence of perch, hydraulic residence time, etc. **Outputs:** A poster was presented at the NZFSS 2016 conference. A paper is in prep.

**Our Land & Water National Science Challenge – Land Use Suitability** – This is a multi-party research project which includes a number of CRIs. Marc Schallenberg is contributing data and information on the resilience and assimilation capacity of freshwater and estuarine systems. This information will be used to estimate contaminant limits which can be used to constrain land use activities in upstream catchments. This project aims to produce a national tool for aligning land use with the sensitivity of receiving environments. Collaborators in the project include Scott Larned, Richard McDowell, and Ton Snelder. **Outputs:** A number of papers are in press or in prep and presentations have been made at a workshop on Socio-Ecological Resilience and Freshwater Tipping Points in Nanjing and at a conference on Tipping Points in Auckland.

**Understanding the Phenomenon of Lake Snow and its Establishment & Spread Among Some New Zealand Lakes** – **Marc Schallenberg** has been collaborating with Phil Novis (Landcare Research) and Emilie Saulnier-Talbot (Laval University) on research into the taxonomy of the centric diatom that causes the formation of nuisance lake snow—on whether it is a new species to New Zealand, on its spread and distribution within New Zealand, and on its historical dynamics in the lakes in which it occurs. Regional councils have begun to collaborate on some of these projects. **Outputs:** A paper is in press. Presentations on the work were made in Wanaka (organised by the Wanaka Branch of the Royal Society) and Queenstown (organised by the Catalyst Group). This research has also been covered in the mass media (e.g., newspapers, TV news, radio).

**In-lake Nutrient Processing in Coastal Lake/Lagoons** – Marc Schallenberg has been leading an ECan/Whakaora Te Waihora project to study the contributions of internal P loading and denitrification to eutrophication of Te Waihora/Lake Ellesmere. This project also provided a platform for PhD student **Josie Crawshaw**'s PhD studies on denitrification. Collaborators in this work included Keith Hamill, David Hamilton, Chris McBride and Dave Kelly. **Outputs:** Three reports (Hamill & Schallenberg, 2016; Hamilton *et al.*, 2016; Schallenberg & Crawshaw, 2016/17) and a number of hui presentations. One paper is in prep.

**Food Web Biomanipulation Techniques to Help Speed Recovery of Lakes from Eutrophication** – **Sami Khan** (PhD student) and **Helen Trotter** (MSc student) have been working on this project focused on eutrophic lakes Hayes and Johnson under the supervision of Marc Schallenberg, Carolyn Burns and Gerry Closs. Part of their work is funded under the University of Waikato-led MBIE programme – the Health and Resilience of New Zealand Lakes. The research has involved studying the trophic linkages around *Daphnia pulex*, the keystone grazer in these lakes. Future work will include *in situ* mesocosms and whole-lake experiments manipulating grazer and primary producer communities. The bloom forming dinoflagellate in these lakes is too big to be grazed by *Daphnia*, which nevertheless has a negative correlation with *Ceratium hirundinella* in these lakes. Therefore, a key question that Sami is working on is how *Daphnia* could indirectly affect the density of *Ceratium*. **Outputs:** A presentation to the Friends of Lake Hayes AGM. Newspaper articles.

**The Causes & Consequences of Multidimensional Individual Specialisation in Freshwater Fish** – In 2017, **Travis Ingram** and his lab have studied individual specialisation of the common bully, *Gobiomorphus cotidianus*. **Nicky Kerr** completed her MSc thesis which found links between individual niches and personality in bullies. PhD student **Marine Richarson** spent the summer working on a mesocosm study of the effects of intraspecific competition and competition with perch on individual specialisation in bullies. **Outputs:** Nicky presented her MSc results at the 2016 NZFSS conference in Invercargill, and Marine presented her results at the Indo-Pacific Fish Conference in Tahiti in October 2017. ■





*Litoria ewingii* (brown tree frog),  
Kelly Tops Arthur's Pass National Park

Photo © Angus McIntosh

# GOVERNMENT ORGANISATIONS & CROWN RESEARCH INSTITUTES

## Department of Conservation



Department of  
Conservation  
*Te Papa Atawhai*

**New:** Tom Drinan (Hamilton) & Nicki Atkinson (Dunedin)

This year the Freshwater team farewelled **Martin Rutledge**, wishing him well with his retirement plans on the lifestyle block that he shares with his partner Cherie. He has already been spotted at a community planting day, so we know he will retain his passion for freshwater conservation. We welcomed **Tom Drinan** and **Nicki Atkinson**, having successfully poached them from Golder and the Murihiku DOC office in Invercargill respectively. We were proud of **Philippe Gerbeaux** receiving an Individual Recognition Award from the IUCN, recognising his work establishing the Oceania Regional Office in Fiji ten years ago.

**Natasha Grainger** has been managing the Freshwater team for most of this year while **Rosemary Miller** has been on leave. Supporting our Operations teams has continued to be a key part of our role, drawing on science to support work on the ground. For example, this has seen us help Operations prioritise their work on non-migratory galaxiids through digitalising all the populations, and ranking them based on the work required and their vulnerability. Ensuring RMA advocacy is underpinned by sound science has also been a key focus, leading to improvements in the opening regime of Waituna Lagoon in Southland and the turning down of an application to create a dam on top of the largest population of one of our most threatened native fish in Otago. DOC has continued to explore how we intend to advance our stretch goal of 50 freshwater ecosystems restored from the mountains to the sea – part of this has been an increased focus and science gathering at five new freshwater sites.

### Arawai Kākāriki Wetland Restoration Programme, Science Outputs 2007–2016 –

DOC's Arawai Kākāriki wetland restoration programme was initiated in 2007 at three internationally significant sites – Whangamarino (Waikato), Ō Tū Wharekai (Canterbury) and Awarua-Waituna (Southland). A national review of the programme was completed in early 2017, led by **Jack van Hal** (AK Coordinator) and **Hugh Robertson**. The good news is that Arawai Kākāriki has been approved to continue until at least 2025, with ongoing investment in science to support freshwater conservation. A key outcome of the review was the collation of more than 170 science outputs, which highlights the invaluable partnerships of the programme with Landcare Research, NIWA, Cawthron Institute, University of Waikato, University of Otago, University of Canterbury, Massey University, University of Queensland and regional councils. Thanks to everyone involved! For further information, contact Hugh Robertson (DOC Freshwater Team), [harobertson@doc.govt.nz](mailto:harobertson@doc.govt.nz). **Outputs:** Macdonald & Robertson (2017). Arawai Kākāriki report cards.

Ō Tū Wharekai/Ashburton Basin wetlands under restoration. Large-scale weed control to enhance native vegetation as part of the Arawai Kākāriki wetland restoration programme.

Photo © Mary Beech, DOC







Moawhitu wetland, D'Urville Island/Rangitoto ki te Tonga – a new wetland hydrology research project was initiated in 2017 by DOC in collaboration with Ngāti Koata, with a view to getting hydrological restoration underway in the next 1–2 years.

Photo © Hugh Robertson, DOC





## Restoring Hydrology in Drained Wetlands

– A new national project was initiated by DOC in 2017 to understand wetland drainage impacts and investigate hydrological restoration options at three large wetlands – Awarua (Southland), Moawhitu (D'Urville Island) and Kaimaumau-Motutangi (Northland). The DOC Operations and Freshwater teams, led by Hugh Robertson, with support from **Amy Macdonald**, Tom Drinan, Nicki Atkinson (all DOC), and the team from Jacobs (led by James Blyth), with input from Dave Campbell (University of Waikato), have installed a hydrological monitoring network at each site. Over the next five years we plan to publish and share research findings, and continue to work with our iwi partners, including Ngāti Koata (Moawhitu) and Ngāi Takoto (Kaimaumau-Motutangi), to progress wetland restoration. For further information, contact Hugh Robertson (DOC Freshwater Team), [harobertson@doc.govt.nz](mailto:harobertson@doc.govt.nz).

## Improving Fish Passage Management in NZ

– DOC, led by **Sjaan Bowie**, have continued to grow their fish passage programme and improve fish passage management. Sjaan has worked with Paul Franklin (NIWA) and Bryn Quilter (Tonkin & Taylor) to provide significant support, coordination and leadership to the NZ Fish Passage Advisory Group. Key highlights have included:

- Regular NZFPAG meetings and newsletters, and further case study guidance developed, promoted and distributed to further improve coordination of fish passage management in New Zealand and highlight key resources and guidance available.
- Progress has been made with NIWA on the development of the national fish passage guidelines through the writing of an overview of legislative fish passage responsibilities in NZ. Information on fish passage management within DOC has been reviewed and updated, and systems improvements identified to improve management.

- NIWA, with support from DOC, has gained funding to establish a national barriers database and assessment protocol.
- NIWA and DOC hosted a student intern for six months to collate data, analyse and assess fish passage information in NZ to support the establishment of the assessment protocol and database.
- Sjaan, along with Paul Franklin (NIWA), Brian Krovalis (Sustainable Futures NZ Ltd) and Gary Williams (Waterscape) (Brian and Gary are both engineers), presented a culvert design course at Auckland University.
- Key advice and support has been provided to multiple levels of the Department on varied areas of fish passage management. Key improvements have been identified, prioritised and initiated.
- Guidance has continued to be updated internally and externally.

**Outputs:** See [www.doc.govt.nz/fishpassage](http://www.doc.govt.nz/fishpassage).

## Recruitment Patterns of Whitebait –

**Jane Goodman**, supervised by **Dave West** (DOC), Gerry Closs and Travis Ingram (University of Otago), is carrying out research on the New Zealand Whitebait Fishery. Jane is collaborating with Shannon Clarke and Raynor Anderson from AgResearch, and Mark Yungnickel and Mike Hickford from the University of Canterbury to look at the genetic structure of four of the five diadromous galaxias around New Zealand. This year Jane has clipped fins from around 1,500 whitebait for genetic analysis. The results of this research will influence future whitebait management. Jane has also been progressing a report pulling together a summary of our current approach to whitebait fishery management, and is also looking into management models of similar fisheries internationally. For further information, contact Jane Goodman (DOC Freshwater Team), [jgoodman@doc.govt.nz](mailto:jgoodman@doc.govt.nz). **Outputs:** Expected by mid-2019. ■

Our fantastic NZFPAG at our meeting in Christchurch April 2017.

FRONT ROW (left to right): Kelly Hughes (ATS Environmental), Megan Kennedy (NZ Transport Agency), Paul Franklin (NIWA; Coordinator), Christopher Fern (Trustpower), Sjaan Bowie (DOC; Coordinator).

BACK ROW (left to right): Zella Smith (Environment Canterbury; filling in for Melissa Shearer), Matt Dale (Te Rūnanga o Ngāi Tahu), Mark Webb (Fish & Game NZ), Trevor James (Tasman District Council), David Boothway (Christchurch City Council), Michael Greer (Greater Wellington), Patrick Lees (Pattle Delamore Partners Ltd), Cindy Baker (NIWA), Alice Bradley (Ministry for the Environment).

ABSENT: Bryn Quilter (Tonkin & Taylor; Chair), Kati Doebling (Cawthron Institute; Communications Advisor lead), Wolfgang Kanz (Gisborne District Council), Bruno David (Waikato Regional Council), Hamish Smith (Kiwi Rail) and Tom Stephens (DairyNZ).

Photo © DOC

**New:** James Shelley, Eimear Eagan (Hamilton), Anika Kuczynski

## Auckland Urban Aquatic Environments

**Envirolink Tools Project on Urban Water Quality Monitoring** – This project involves testing and providing guidance on low-cost, but robust, methods for collecting water quality data in urban catchments. **Staff involved:** Jenni Gadd, Pete Pattinson and Christian Hyde, in collaboration with regional councils, with GWRC as project champion.

## Christchurch Freshwater Ecology

**The Estuarine Trophic Index Project** – As part of an Envirolink Tools Grant (Contract No. C01X1420), **John Zeldis, Amy Whitehead, Dave Plew, Bruce Dudley** and **Richard Storey**, along with colleagues from Greater Wellington Regional Council, Hawke's Bay Regional Council and Wriggle Coastal Management, developed three online web applications in the Estuarine Trophic Index (ETI) Toolbox. These tools allow users to interactively identify the susceptibility of NZ estuaries to eutrophication (Tool 1), understand the past or current trophic state of an estuary using measured environmental data (Tool 2) or predict an estuary's trophic state under different scenarios (Tool 3). We will continue to develop the ETI tools over the coming year. **Outputs:** <https://shiny.niwa.co.nz/Estuaries-Screening-Tool-1>, <https://shiny.niwa.co.nz/Estuaries-Screening-Tool-2>, <https://shiny.niwa.co.nz/Estuaries-Screening-Tool-3>.

**Towards Improved Predictability of Periphyton in Rivers** – Working with Environment Canterbury (Graeme Clarke and Shirley Hayward), **Cathy Kilroy** and **Janine Wech** completed an analysis of three years of data from rivers in Canterbury, which explored relationships between preceding flows, nutrients and other environmental variables and periphyton (as chlorophyll *a*). One of several findings was that the size of flow events that effectively removed periphyton varied across sites, and using the frequency of effective flow as a predictor (rather than 3 x median flow), improved predictability of chlorophyll *a*. We are now exploring the usefulness of effective flows as predictor variables in other datasets.

**Uncertainty in Coupled Hydrological & Ecological Models** – As part of a GNS project on improving groundwater models, **Simon Howard**, working with NIWA's hydrology team, has been coupling existing hydrological and fish habitat models to explore how uncertainty in multiple modelling parameters contributes to uncertain management outcomes.

**The Influence of Flow Alteration on the Temporal Variability of Stream Food-web Structure** – As part of their ongoing research within NIWA's Sustainable Water Allocation Programme, **Phil Jellyman, Shan Crow** and **Doug Booker** will be examining whether variation in stream flow regime is the major driver of temporal variability in stream food-web structure. This is an analysis based on a 3-year data-collection project within this research programme that has involved the entire freshwater ecology team and students from several institutions. **Outputs:** Jellyman, P.G.; Crow, S.K.; Booker, D.J. (2017). Quantifying temporal variability in food-web structure: are environmental drivers more important than network position? Presentation at 1<sup>st</sup> annual Community Ecology conference, Budapest, Hungary (September 2017).

## Hamilton Freshwater Ecology

**Fish Passage** – NIWA continues to develop its fish passage work programme. As well as being in the final stages of developing national fish passage guidance and working on development of a national fish passage assessment protocol, the team is just starting work on a new 5-year MBIE funded research programme. This will see new collaborations with Heide Friedrich and John Montgomery (University of Auckland), and focus on better understanding fish behaviour and interactions with their hydraulic environment. NIWA also continues to work with DOC (Sjaan Bowie and Dave West) on the development of national fish passage management resources. In partnership with DOC, we coordinate the multi-agency New Zealand Fish Passage Advisory Group (NZFPAG), which has been an instrumental pathway for engaging practitioners and end-users in promoting and adopting best-practice. The national fish passage assessment protocol and associated web-tools to assist with environmental reporting and prioritisation are being developed as part of an Envirolink Tools project. This will provide a nationally consistent approach for cataloguing the location of instream

structures and quantifying the risk that they impede fish passage. A novel part of this project is the use of Bayesian network models to incorporate expert knowledge and create an objective evaluation of fish passage success given different structure characteristics. Also, Paul Franklin and Cindy Baker travelled to Chile, Denmark and the UK as part of an international EU RISE funded project on fish passage in the Southern Hemisphere (KEEPPISH). This provided the opportunity to establish relationships with international experts in the field of fish passage research and engage with local end-users. The shared experiences gained through these visits will help to enhance the scientific outcomes of our new MBIE funded fish passage research. In particular, collaborative research work is already being developed, with Kim Aarestrup from Denmark Technical University (DTU) to tackle the long-standing challenge of identifying the spawning location of New Zealand's iconic longfin eel. **Staff involved:** Paul Franklin, Cindy Baker, Ellie Gee, Kat Reeve, Peter Williams, Shannan Crow, Phil Jellyman and Don Jellyman. **Outputs:** Collier *et al.* (2017).

**Understanding Piharau/Kanakana** – NIWA is working alongside mana whenua and Te Rūnanga o Ngāi Tahu (TRONT) to understand the critical life stage habitats utilised by piharau/kanakana (lamprey) while in freshwater, as well as investigate dispersal at sea, and population genetics across the country. This five year MBIE funded research programme, which is focused on the Southland region, will provide important information for the management of this taonga species nationwide. During 2017 we successfully captured and PIT tagged 191 migrant adult kanakana in the Waikawa River in partnership with Waikawa mana whenua. To determine habitat use during maturation and spawning, over the next year researchers, including whānau, will track the movements of kanakana using a custom-made portable PIT system as they undertake their upstream migration. In addition, 12 adult kanakana were sacrificed to initiate the stable isotope investigations. These stable isotope analyses represent the first research into host species utilisation of a Southern Hemisphere lamprey species. Also, during July 2017, Te Wai Māori Trust instigated and have formalised a National Piharau/Kanakana Collective with representatives from NIWA, MPI, DOC, MfE, Te Rūnanga o Ngāi Tahu, and Taranaki and Whanganui iwi. One key objective of the Collective is to develop a National Piharau/Kanakana Restoration Strategy aimed at guiding iwi led management of this taonga species. Research objectives from the current MBIE programme will help inform this national strategy. **Staff involved:** Cindy Baker, Kat Reeve, Peter Williams, Amber Sinton and Don Jellyman. Collaborators: Jane Kitson (Kitson Consulting Ltd), Te Ao Marama Inc. (Stevie Blair) and Waikawa mana whenua. **Outputs:** Baker *et al.* (2017); Buchinger *et al.* (2017).

## Habitat Bottlenecks for Large Galaxiid Reproduction

– As part of a new 5-year MBIE Endeavour Fund project **Cindy Baker, Paul Franklin** and the rest of the Hamilton freshwater ecology team will be extending their research on habitat requirements for large galaxiid reproduction. Building on our recent work on giant kōkopu spawning in Hamilton, we will be investigating how land use impacts on the availability and suitability of habitats for giant kōkopu spawning, and the potential consequences for reproductive success. **Outputs:** Baker *et al.* (in press).

## Riparian Restoration Investments & Outcomes: a Citizen Science Approach

– While the ultimate goal of this project is to understand ecological responses to riparian revegetation, the short-term focus is a little different. This year we (Richard Storey, **Amanda Valois, Brian Smith, Rob Davies-Colley, Rebecca Stott, Darcel Rickard** and **Cathy Kilroy**) are focused on redesigning NIWA's Stream Health Monitoring and Assessment Kit in consultation with a wide range of users. We hope in a year's time to have a kit that uses modern sampling methods and is linked with smart phone apps and a website for data entry and exploration. Also, this year we are compiling a 'National Riparian Restoration Database', encouraging community groups, farmers, etc. to enter details of their projects at <https://riparian.niwa.co.nz>.

## Connectivity & Dispersal in Restoring Aquatic Invertebrate Communities

– One of the vexing problems in stream restoration is how to re-establish macroinvertebrate communities after the habitat and water quality have been improved. **Elizabeth Graham, Brian Smith** and Richard Storey, along with Vanessa Barbosa (a PhD student from Waikato University, supervised by Ian Hogg and Kevin Collier) are investigating the abilities of insects to disperse across pasture landscapes and along riparian corridors via drift and flight. We are using new population genetics techniques and stable isotopes to explore whether in combination these methods can give insights not possible with either one alone.

## Oviposition habitat and effects on aquatic insect community structure

– **Brian Smith** and **Richard Storey** are continuing to explore the importance of oviposition habitat for aquatic insects by investigating how insect community structure is affected by the lack of emergent rocks in some streams. We have found that species requiring these structures still appear when the structures are lacking, so we are now exploring the pathways by which they may arrive. This project is part of a Masters for **James Cooper**, supervised by Kevin Collier at University of Waikato. ■



Diffusive gradient in thin film (DGT) array in  
Uretara Stream.

Photo © P. Scholes



Electric fishing Ohineangaanga Stream.





# COUNCILS & UNITARY AUTHORITIES

## Bay of Plenty Regional Council



**New:** James Dare

Bay of Plenty Regional Council's freshwater focus is currently concentrated on National Policy Statement for Freshwater Management implementation. Projects range from ESource modelling to periphyton and fish monitoring; monitoring which has not regularly been undertaken in the past. Key resource management issues in each Water Management Area (WMA) will need to be addressed by objectives and management options, including nutrient enrichment, rising nitrate levels and over-allocation.

### Bay of Plenty Periphyton Monitoring

**Programme** – Until recently, BOPRC did not monitor periphyton in streams throughout the region. **Alastair Suren** developed a monitoring programme that commenced in October 2015 where algal biomass and cover are monitored in 30 streams on a monthly basis. Initial results show that average chlorophyll biomass in the 30 streams sampled was very low, and below 50 mg/m<sup>2</sup>—equivalent to the NOF A band. Examination of the average cover data showed that 14 of the sites had low cover indicative of 'excellent condition', while four sites had high cover (>50%), indicative of sites in 'fair condition'. These sites also exceeded the recommended >30% for angling and aesthetic values. Nutrient analysis showed that sites were located in the eutrophic range of dissolved reactive phosphorus (DRP) and dissolved inorganic nitrogen (DIN).

### Investigation of Copper in Surface Water & Stream Sediment of the Uretara Stream Using DGT Passive Samplers & Grab Samples

– Long term application of copper (Cu) based horticultural products can result in a build-up of Cu in the immediate soil where it has the potential to be transferred to nearby surface waters and negatively affect aquatic life. Copper product application has increased in the Bay of Plenty Region in New Zealand to treat the kiwifruit vine disease *Pseudomonas syringae* pv. *actinida* (PSA), and the risk that the application of these products could be affecting surface waters is increasing. This study, undertaken by Masters student Ellie McLellan, investigated the Cu concentration in the Uretara Stream of the Western Bay of Plenty Region, where the surrounding land use is predominantly kiwifruit orchards, using grab samples and passive samplers. Sampling was conducted over

a period of three weeks with passive sampler deployments of 7 and 14 days. This study established that the measured Cu concentrations in the water column and sediment of the Uretara Stream are unlikely to be of a concern to aquatic life and the use of passive samplers is a viable method.

**Rare Fish Find** – New populations of native fish (including two whitebait species) have been recorded for the first time in parts of the region during fish surveys by Council's science team. Recently published Fisheries Assessment reports show that kōaro are living in the upper reaches of a number of Rangitāiki River tributaries, above Lake Aniwhenua. Shortjaw kōkopu were discovered for the first time in the Ohineangaanga Stream which feeds into the Kaituna River, and new populations of banded kōkopu were found in several streams throughout the Kaituna and Waitahanui catchments.

**Kopeopeo Canal Remediation Project** – This project will remove and safely store up to 40,000 m<sup>3</sup> of dioxin contaminated sediment from Kopeopeo canal, situated near Whakatāne, into containment sites. Dioxin contaminated sediment is a result of historic discharges from an old sawmill site. Following adoption of the new dredging and dewatering methodology, and the granting of the consent variation in September 2016, a physical works contract was signed in late 2016. The resource consent issued for the project requires the euthanasiation and disposal of all contaminated fish prior to dredging to ensure they are not eaten, and to allow monitoring of fish tissue quality following the remediation works. In order to establish the best way to do this and the likely number of eel and other fish that will be caught in the nets, the project team worked with freshwater ecologists and Ngāti Awa to complete a trial in May 2017. The trial will be used to evaluate the capture and release of any longfin eels that are likely to be migrating through the canal, rather than resident species that would be contaminated. The eel trial report is available on the Reports and Key Documents page of the Kopeopeo Canal Remediation Project website: [www.boprc.govt.nz/our-region-and-environment/pollution-prevention-and-compliance/kopeopeo-canal-contamination-remediation-project](http://www.boprc.govt.nz/our-region-and-environment/pollution-prevention-and-compliance/kopeopeo-canal-contamination-remediation-project).



Council officer Thomas McElroy collecting chlorophyll *a* at Manganui Stream with a modified periphyton machine built by council staff.

Photo © Scott Cowperthwaite



Council officer Katie Blakemore working together with Ngaa Rauru Kiitahi to test water quality in the Mangamingi Stream.

Photo © Alan Davis, Ngaa Rauru Kiitahi





## NPS-Periphyton Monitoring Programme

– This programme is designed to monitor the occurrence and abundance of periphyton across the region. A simplified (SHMAK, NIWA) technique is used to measure periphyton abundance at twelve sites on monthly basis. A sample is collected in conjunction with this to measure biomass of chlorophyll *a*. Water samples are also collected to measure dissolved inorganic nitrogen (DIN) and dissolved reactive phosphorus (DRP) as per the National Objective Framework (NOF) requirements. Conductivity, pH and black disc will also be measured at the monitored sites. **Staff Involved:** Katie Blakemore, Alex Connolly and Darin Sutherland. **Outputs:** Technical report.

## Riparian Management Water Quality Management Programme

– The riparian management water quality programme was developed to monitor the long-term effect of comprehensive riparian planting in the Taranaki Region. A draft comprehensive report compiling the results and analyses of long term water quality and riparian data had been completed for Kapoiaia Stream, one of the four targeted catchments for the riparian programme. This catchment has been monitored at three sites (upper, mid and lower catchment) for the last 16 years. Where riparian planting has matured over the last 30 years or so, water temperatures have a less defined relationship with flow rate, and the daily temperature range has reduced. The report will be peer reviewed by NIWA. **Staff Involved:** Bart Jansma, James Kitto, Alex Connolly, Darin Sutherland and Land Management Officers. **Outputs:** Technical report.

## State of the Environment Cultural Health Monitoring Programme

– Taranaki Regional Council's Long Term Plan (2015–2025) and Regional Policy Statement make provision for the Council to work with iwi on resource management matters. This includes the provision of training and technical advice and activities for Māori capacity building, including the development of iwi environmental plans and undertaking environmental monitoring. The Council is involved in providing training and technical advice on stream health monitoring for physical habitat assessment, water quality and macroinvertebrate monitoring. The programme utilises the Stream Health Monitoring and Assessment Kit (SHMAK) for community groups to collect robust and meaningful scientific data on stream health. In the past year, this programme has been rolled out to a second iwi, and is planned to be extended to a further iwi group

by the end of the year. Several groups are also working with the Cultural Health Index (CHI) alongside SHMAK. **Staff Involved:** Sam Tamarapa (Iwi Liaison Officer), Kevin Archer (Education Officer) and Katie Blakemore (Technical Officer). **Outputs:** Baseline data is currently being gathered. A report will be developed in conjunction with iwi as sufficient data becomes available.

## Investigation on High *E. coli* Levels in Mangaoraka Stream

– An investigation on the Mangaoraka Stream was launched to get to the bottom of the ongoing intermittent high faecal indicator bacteria count reported in long term physicochemical water quality SOE programme at this site. The site presently has a NOF rating of 'D' for *E. coli*. A collaboration between the Science Services and Inspectorate teams was initiated to help carry out the surveys (during dry weather conditions) and investigate the source of the high *E. coli* counts in the catchment. The investigation is still on-going and the results of the investigation will be reported once the results for the surveys and investigations have been completed and analysed. **Staff Involved:** James Kitto, Alex Connolly, Ray Harris, and the Inspectorate Team.

**Fish Passage** – This year a greater emphasis has been placed on identifying and resolving barriers to fish passage within the Taranaki region, thanks in part to continued pressure from wider stakeholders gaining some traction. There has been little progress on this since the early 2000s, so it's great to see it gain some attention. As a part of this, we are developing a database within IRIS, where we can store information relevant to barriers. This should allow us to prioritise them for remediation. A presentation has been delivered to most of our field staff, detailing how barriers to fish passage can impact on our freshwater fish communities, and what to look for while they are out and about. Barriers that were identified a number of years ago are to be inspected and assessed, with this information forming the trial for our developing database. Hopefully in the future a field application will be developed that will allow field staff to enter this information directly, and this should complement work that is being completed by the NZ Fish Passage Advisory Group. **Staff Involved:** Bart Jansma and Brooke Thomas.

**Outputs:** Fish passage database in IRIS. ■

**Alicia Catlin** has coordinated the REMS SOE monitoring programme and the freshwater mussel surveys; **Bruno David** has been working on various fish-related projects; **Mike Lake** has been co-ordinating research into the impacts of flood pumps on migrating eels and monitoring of the impacts of river works; **Deniz Ozkundakci** and **Paula Reeves** have been working on various lake related projects including a survey of data deficient geothermal lakes; **Michael Pingram** has been coordinating the development of a large river monitoring programme; **Eloise Ryan** has been working on a number of water quality related projects including investigating black water low DO events; **Josh Smith** has coordinated the SOE freshwater fish monitoring programme; **Asaeli Tulagi** has coordinated the regions water quality monitoring programme; and **Bill Vant** continues his work on water quality in the region.



Electric fishing an unnamed tributary of the Manganui River, December 2016.

Photo © Nicole Hanrahan



Ecological assessment of an unnamed tributary of the Manganui River, December 2016.

Photo © Nicole Hanrahan

## WRC Freshwater Fish SOE Monitoring

**Programme** – Seventy-two sites were surveyed between December 2016 and early April 2017. Of these, 15 sites were fished via the Joy et al. trapping methodology (i.e., 6 fyke nets and 12 minnow traps), and 57 sites via electrofishing. This year's field monitoring team consisted of **Josh Smith**, **Nicole Hanrahan** (student), **Matthew Barson** (student) and **Baylee Kelepamu** (student), with support from Bruno David, Alicia Catlin and **Kayla Manson** (student). We are currently collating and analysing the data collected via the freshwater fish data capture system. For a copy of the latest version of the data capture system please contact Josh Smith ([josh.smith@waikatoregion.govt.nz](mailto:josh.smith@waikatoregion.govt.nz)). **Outputs:** David *et al.* (2016).

## Regional Ecological Monitoring of Streams (REMS) Programme

– Around 140 sites were surveyed between January and the end of March 2017. At each site, ecological habitat assessments were undertaken, and invertebrate samples were collected using standardised methodologies. This year's field monitoring team consisted of Alicia Catlin and Kayla Manson (student), with support from **Mark Hamer**, Michael Pingram, Josh Smith and **Nathan Singleton**. We are currently collating and analysing the data collected for the 2017 season. For more information about this programme please contact Alicia Catlin ([Alicia.Catlin@waikatoregion.govt.nz](mailto:Alicia.Catlin@waikatoregion.govt.nz)).

## Freshwater Mussel Surveys 2017

– For the past three years WRC has undertaken a freshwater mussel mark-recapture survey on Ohautira Stream, Raglan. Over 200 mussels of both species (*Echyridella menziesii* and *E. aucklandica*) were tagged and 186 mussels were recaptured from previous years. In addition, eight sites were surveyed using standardised mussel methodologies (unpublished technical report) throughout the Hauraki Plains. Unfortunately, the weather got too wet to do any further sites! This year's monitoring team consisted of Alicia Catlin, Kayla Manson (student), Mark Hamer, Michael Pingram, and Nathan Singleton.

## Fish Friendly Pump Assessment

– Waikato Regional Council are trialling the installation of a Bedford Fish Friendly Pump at one of the pump stations that it manages. To assess the improvement in fish survival a monitoring programme was established to look at the effects of both the original pumps and the newly installed pumps. **Jacques Boubée** of Vaipuhi Freshwater Consulting is conducting the research in collaboration with Mike Lake and Bruno David, and supported by **Taylor Scott** and staff from the environmental monitoring team. **Outputs:** An interim report documenting the impact of the traditional axial pump will be available soon. Construction of the new pump station will be completed in September 2017.

### Can Acoustic ‘Listening’ Receivers be Used to Quantify Eel Mortality at Pump Stations?

– This pilot project seeks to investigate the use of hydrophones and the sounds made by eels going through floodpumps as a means of documenting mortality and timing of downstream adult migration at pumping stations in the Waikato Region. During work on another project it was noticed that the sound made by migrant eels going through flood pumps was audible and possibly distinct. To investigate this potential Bruno David, Josh Smith (WRC) and Matthew Pine (The Styles Group) have been documenting the type sounds of eels greater- and less than 600 mm going through a pumping station to ‘benchmark’ an eel sound algorithm for wider deployment of hydrophones. Recorded sounds are also being related to resultant ‘condition’ of eels at pump outlets as described photographically and by x-ray to see if certain sounds relate to particular trauma types. **Outputs:** a manuscript and report will likely to be generated from this pilot project describing the potential for this approach to be widely and remotely deployed. Ultimately the idea is to identify priority problem pumps for closer assessment and also refine key periods for migration and timing at these structures to help inform more effective resource consent conditions (e.g., refining critical trap and transfer periods).

### Using otolith microchemistry to identify key recruitment sources for native fish in the lower Waikato River

– This project seeks to understand key recruitment sources for some native fish species in the lower Waikato River. Since 2013, Bruno David (WRC), **Matt Jarvis** (Otago University), **Callum Bourke** (WRC), Josh Smith (WRC) and **Kevin Collier** (Waikato University) have been collecting and analysing fish and water samples from lake and river sources throughout the lower Waikato system. Surprisingly, data collected to date for more than 100 banded and giant kōkopu juveniles suggest that their recruitment to various watercourses is almost exclusively driven by non-diadromous recruitment arising primarily from riverine lakes in the lower river. Otolith results for Sr 87/86 isotopes and trace element data for juvenile fish suggested that Lake Waahi in particular seems to be disproportionately providing recruits to wider parts of the Waikato river scape. These data were supported by a number of follow up winter larval fish surveys across a wide variety of lakes from 2015–2017 that demonstrated that while galaxiid larvae were captured in the vast majority of lakes, the relative abundances from trawls in Lake Waahi were orders of magnitude greater than any of the other lakes. A further surprising finding was that some of the inanga analysed also exhibited some potential for non-diadromous recruitment. Likely freshwater sources for these fish are currently being investigated. **Outputs:** Two manuscripts are currently in preparation from this work. It is envisaged that outputs will identify key areas in the lower river that can be targeted for future Waikato River Authority restoration funding and refine key periods for migration and timing of these fish that should be avoided with respect to activities requiring resource consent. ■



Freshwater mussels from the Ohautira Stream, April 2017

Photo © Kayla Manson



Measuring larval galaxiids collected from Lake Waahi in August 2017 – two cohorts evident.

Photo © Josh Smith



Trawling for galaxiid larvae on a crisp winter morning at Lake Rotokauri, a lower Waikato peat lake, August 2016.

Photo © Josh Smith



# RESEARCH & CONSULTANCY COMPANIES

## Aquanet Consulting Ltd



**New:** Lucy Cramp (Masters student), Jeanne Sudre and Valentin Grabin (short-term internships)

In the last twelve months Aquanet Consulting have kept very busy, undertaking a wide array of projects, including project management, field studies, technical reports, peer review and involvement in Hearings as expert witnesses.

**Olivier Ausseil** continues to be engaged as Project Manager or technical expert on numerous re-consenting projects for water and wastewater treatment plants around the lower North Island). **Amy Feck** and **Fiona Death** continue to undertake fieldwork, compliance monitoring and reporting for these projects. **Yen Dinh** is still helping with all of our macroinvertebrate sample processing, fitting this in around her PhD.

This year, Olivier was appointed as Project Manager for the National Environmental Monitoring Standards (NEMS) for discrete water quality, and has been part of the Technical Advisory Group for Wellington Water's global stormwater consent application. On the regional planning front, he has also been kept busy attending Hearings and providing evidence on behalf of the Wi Pere and Mangatu Trusts in relation to the proposed Gisborne Regional Freshwater Plan (Waipaoa Catchment Plan), and has assisted the five Waikato River iwi in their submissions to the Waikato 'Healthy Rivers' Freshwater Plan.

Aquanet have also hosted two French students this year.

**Jeanne Sudre** undertook a short-term internship with us to gain some experience in the world of freshwater consulting.

**Valentin Grabet**, also here for a short while, helped with work on the Owhiro Stream project.

**Owhiro Stream** – Aquanet were commissioned by Greater Wellington Regional Council (GWRC) to provide an assessment of the nature and scale of effects of a discharge from the T&T Landfill on the water quality and instream ecology of the Owhiro Stream during and following an intensive rainfall event in November 2016. Fiona and Amy analysed water quality data collected by GWRC as well as processing and analysing macroinvertebrate samples collected by Olivier. Results indicated that the T&T Landfill appears to be causing significant adverse effects on water clarity and colour and on aquatic life on an ongoing basis. Of particular interest was a noticeable change in the snails found in December 2016 between sites upstream and downstream of the landfill. At the site upstream of the T&T Landfill, and

also down at Owhiro Bay, the snails looked normal in shape and colour, while those downstream of the landfill were an orangey colour and presented abnormally-shaped shells, possibly a result of the deposition of iron/manganese floc (see photos on next page). **Outputs:** A report for GWRC (Ausseil *et al.* 2017) and newspaper articles. Olivier is involved in an ongoing project assembling monitoring data and information relating to the Owhiro Stream, and looking at Citizen Science options.

### National Environmental Monitoring Standards (NEMS) for Discrete Water Quality

– Olivier was appointed as Project Manager for NEMS in early 2017. This project has involved the development of environmental monitoring standards with input from a number of agencies responsible for discrete water quality sampling of freshwater and near-shore coastal waters across New Zealand, including regional and unitary councils, analytical laboratory industry representatives, the National Institute for Water and Atmospheric Research Ltd (NIWA) and the Institute of Geological and Nuclear Sciences Ltd (GNS Science). The aim is to have a Standard adopted throughout New Zealand that will allow all data to be collected, processed and quality coded appropriately to facilitate data sharing.

**Outputs:** Draft NEMS document to be released for comments in late 2017.

**Marton Water Take** – Aquanet have been working with the Rangitikei District Council (RDC) on re-consenting for the Marton water supply. As part of this, Fiona and Amy, along with Kevin from RDC, have been out on the Marton reservoirs undertaking monthly water quality monitoring and depth profiling. Preliminary results indicate thermal stratification of the reservoirs and significant nutrient inputs following storm events. ■



Examples of snails (*Potamopyrgus* sp.) collected from: **A.** upstream of T&T landfill, **B.** downstream of T&T landfill, **C.** Owhiro Stream upstream of Murchison Street Bridge, and **D.** Owhiro Stream at Owhiro bay, 22nd December 2016.

Photos © Amy Feck



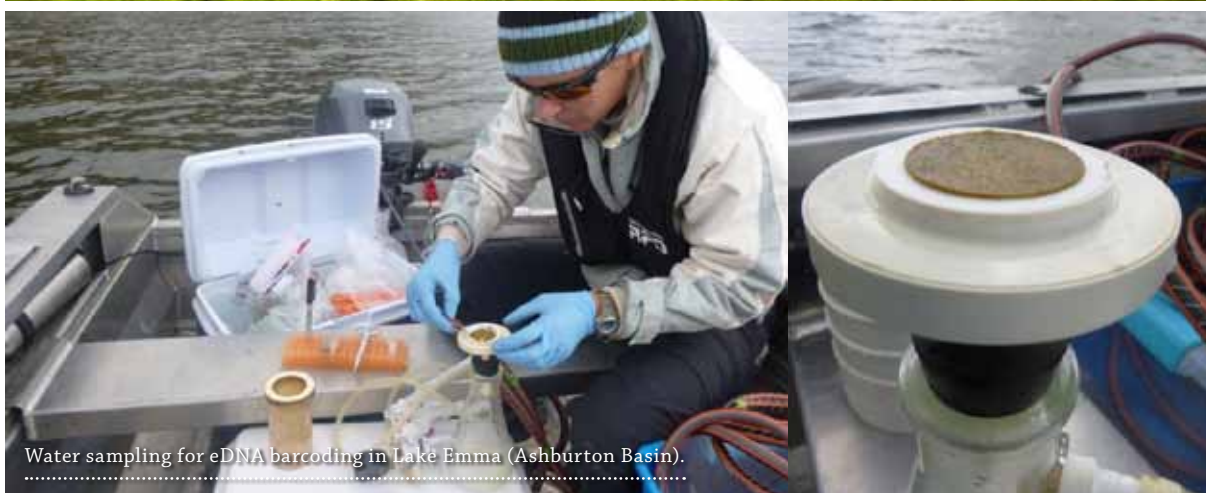
Amy and Kevin sampling on the Marton Water reservoirs, March 2017.



2017 was a busy year for the Cawthron Institute Freshwater Team. **Roger Young** has continued to lead the team well and we are growing stronger every year. Some of our key projects are listed below. Other things we've been up to... **Joanne Clapcott** has been disappearing up the coast to work with Hikurangi Takiwa Trust, and when in town she and **Annika Wagenhoff** have been successful in developing stressor-specific macroinvertebrate metrics for the NPS-FM. **John Hayes, Karen Shearer, Rasmus Gabrielsson** and **Eric Goodwin** highlighted how important river flow is for fish and how it is related to their feeding habits ([www.vimeo.com/228317853](http://www.vimeo.com/228317853)). **Dave Kelly, Susie Wood** and **Sean Waters**

are trying to make a point that, in addition to our rivers, we also need to save our lakes. **Robin Holmes** has been working diligently on his PhD (restoring fish habitat). **Mark Newton** and **Annika** showed off their collaboration skills with iwi, stakeholders and councils in Marlborough ([www.vimeo.com/214937013](http://www.vimeo.com/214937013)), and **Kati Doebling** is still trying to come to terms with the state of Fiji's waterways. She is looking forward to returning to the 'Cawthron Base' in Nelson at the end of 2017.

If you want to find out more about us and our cool projects have a look at our website: [www.cawthron.org.nz/coastal-freshwater/services/freshwater-ecology](http://www.cawthron.org.nz/coastal-freshwater/services/freshwater-ecology).





## Measuring & Managing Lake Ecosystem Health

– Dave Kelly, Susie Wood and Sean Waters have been working on a number of lake management projects in conjunction with DOC, Greater Wellington Regional Council (GWRC), and Horizons. As part of work in the Lake Health and Resilience MBIE project with DOC (Ashburton Basin area) Dave and Susie have been examining foodwebs and eDNA methods in lakes that have undergone regime shifts from macrophyte to benthic algal dominated. Sean has been coring and analysing surface sediments from a number of lakes looking at geochemistry factors controlling sediment phosphorus recycling, predominantly in shallow lakes. Dave and Sean have been designing monitoring and restoration programs for several small shallow lakes not presently meeting the NPS-FM bottom lines, including lakes Waitawa (GWRC) and Oporoa (Horizons). Dave and Susie have been conducting shading trials in the Stuart Macaskill lakes (GWRC) to examine the extent of shading required to reduce benthic cyanobacteria growths in the water supply lakes.

## Murphys Creek Collaborative Stormwater Management

– Mark Newton managed and facilitated a collaborative stormwater management project in Blenheim during 2016–2017, commissioned by Jon Cunliffe from Marlborough District Council. When the project began, various parties were at loggerheads over how to manage increased stormwater that would be generated by future upstream developments in the catchment. A costly court case was imminent. By leading a group of stakeholders and iwi representatives through the Structured Decision Making Process over the course of five workshops and a field trip, a solution was found that protected the values of the group members and was acceptable to all. Annika Wagenhoff provided freshwater ecological advice throughout the process. **Outputs:** [www.vimeo.com/214937013](http://www.vimeo.com/214937013).

## Macroinvertebrate Metrics for the National Policy Statement for Freshwater Management

– Key outcomes of a large Cawthron-led multi-institutional project, funded by the Ministry for the Environment (MfE), included the development of stressor-specific macroinvertebrate metrics and a framework for inclusion of new and existing macroinvertebrate metrics in the National Policy Statement for Freshwater Management (NPS-FM). Project team members were Joanne Clapcott (project manager), Annika Wagenhoff (stressor-specific metric development) and Roger Young. Other collaborators were Martin Neale (Martin Jenkins consultancy), Russell Death (Massey University), Richard Storey, Brian Smith, John Quinn (NIWA), Jon Harding (University of Canterbury), Christoph Matthaei (University of Otago) and Kevin Collier (University of Waikato). **Hayden Rabel**, Eric Goodwin and **Javier Atalah** provided statistical help.

## Net Rate of Energy Intake (NREI) & Hydraulic-habitat Modelling

– John Hayes has continued working with Eric Goodwin, Karen Shearer, Murray Hicks and Rasmus Gabrielsson on relationships between invertebrate drift and flow in relation to understanding effects of water allocation. John and Eric have also been further developing a net rate of energy intake (NREI) model to assess the flow requirements of drift feeding trout. This research contributes to NIWA's Core-Funded Sustainable Water Allocation Programme which Murray leads. A significant milestone for that programme in July was a workshop and proceedings report that John led on a 'Review of the rationale for assessing fish flow requirements and setting ecological flow and allocation limits for them in NZ'. The workshop and report summarised recent research by Cawthron and NIWA on the effects of flow on fish and their invertebrate food. The workshop was pitched mainly to regional council and MfE staff, but was also attended by DOC and Fish and Game representatives, and some environmental consultants. John, Eric, Karen and Rasmus also collaborated with NIWA Christchurch staff on two large consulting projects for Environment Southland and Otago Regional Council, undertaking hydraulic-habitat modelling and drift transport and drift feeding trout NREI modelling to assess environmental flow regimes for the lower Oreti and upper Clutha rivers. **Outputs:** [www.vimeo.com/228317853](http://www.vimeo.com/228317853), [www.cawthron.org.nz/news/general/2017/opportunity-donors-support-research-our-freshwater-fisheries-launched](http://www.cawthron.org.nz/news/general/2017/opportunity-donors-support-research-our-freshwater-fisheries-launched).

## Understanding Toxin Production & bloom Formation in Benthic & Planktonic Cyanobacteria

– Experimental, field work and data analysis is on-going to further knowledge on variables that regulate cyanobacterial toxin production and bloom formation in New Zealand rivers and lakes. Key outputs include two reports for MfE, and several scientific manuscripts. **Staff Involved:** Susie Wood, Jonathan Puddick, Annika Wagenhoff, Kati Doehring, Javier Atalah and Laura Biessy (Cawthron), with Ian Hawes (Waikato), Tara McAllister (Canterbury), Laura Kelly, Ken Ryan (Victoria) and Kim Handley (Auckland).

## The Accumulation of Cyanotoxins in Aquatic Organisms

– The assessment of nodularin accumulation in New Zealand shortfin eels from Te Wairewa (Lake Forsyth). Key findings were that nodularin levels in shortfin eels corresponded with the intensity of the *Nodularia* blooms in the lake, suggesting that further risk assessments should be conducted if blooms re-intensify. The assessment of nodularin accumulation and depuration in Australian black bream and flathead fish used a feeding study approach. Key findings were that nodularin was accumulated and depurated at different levels and rates between the two species of fish. **Staff Involved:** Susie Wood and Jonathan Puddick (Cawthron), with Barbara Dolamore (Ara Institute) and Jackie Meyers (University of Melbourne). ■

**Environment Investigators – Kirsty Brennan, Shelley McMurtrie, Nick Hempston, and Bronwyn Gay** have been engaging with 21 schools and pre-schools as part of this programme that has been running in 2016 and 2017 in collaboration with the Whitebait Connection. *Environment Investigators* is an experiential learning programme that focuses on inanga/inaka/whitebait to increase awareness, belonging and kaitiakitanga/guardianship about/for their local environment. It increases knowledge of current environmental topics within a local context, and provides support for kids to have a voice for their environment. The kids learn about the inanga life cycle, habitat and threats, undertake inquiry topics related to freshwater, then get to experience what it's like to be a scientist by undertaking spawning habitat assessments. They practice their role as kaitiaki/guardian through caring for inanga in tanks in their classroom, and continue their learning through resources the EOS Ecology team developed for this purpose. Our team supports the students undertaking action projects, helping them realise their potential for direct conservation action. In 2016, kids from three schools presented their views to both regional and city council – gaining improved protection of local inanga spawning habitats. Bronwyn has designed some amazing early childhood learning resources for inanga that have proven to be a great hit with the early childhood centres involved in the programme. Nick, **Siobhán Culhane** and **Emily Demchick** are enjoying caring for the inanga delivered to the schools to care for, prior to their release back to the river as part of an inanga celebration day. **Outputs:** Early Childhood Learning (ECE)/Te Whāriki education programme and associated resources.

**Canterbury's Erosion & Sediment Control Guidelines** – Shelley assisted Environment Canterbury during the development of their new Erosion and Sediment Control Guidelines that has been published as an online toolbox. Along with an introductory video on the impacts of sediment on streams, she also presented on videos showing end-users how to effectively monitor suspended sediment in construction sites and receiving environments. **Outputs:** Online publication and linked videos: <http://esc.canterbury.co.nz/start>.



## Heathcote River Stabilisation Bank Works

– Shelley has been working with BECA Christchurch in a 6 km bank stabilisation project along the mid reaches of the Ōpāwaho/Heathcote River. As the ecology design lead, Shelley has been involved in working ecology into the bank stabilisation programme, with features such as log j-hook vanes, eel pipes, low flooded riparian banks, channel narrowing and gravel cleaning all incorporated into the proposed designs. Emily Demchick and **Alex James** have been working on the AEE reporting for the resource consent application. **Outputs:** Design drawings, technical reports, AEE report.

**Eden Project NZ Concept Plans** – Shelley has been working with Lincoln Design Lab, Matapopore and Eden Project UK to develop concept landscape designs for an environmentally focused social enterprise visitor attraction that, if successful, would form part of the re-imagined Residential Red Zone of the Ōtākaro/Avon River. Shelley's role as the ecology design lead has seen her working to ensure ecology is a core part of the design process. **Outputs:** [www.edenprojectnz.co.nz](http://www.edenprojectnz.co.nz).

**Kā Pūtahi/Kaputone Creek Realignment – Year One** – A section of the peri-urban Kaputone Creek was realigned in 2016. To chart recolonisation and succession among aquatic biota after one year a comprehensive ecological survey was undertaken by Nick, Siobhán and Emily, with Alex doing data analysis and reporting. We also provided options on how the instream habitat can be further enhanced in the newly created stream reach. **Outputs:** Dataset and report.

**He Ara Kotahi Bridge Consenting** – Alex provided expert ecological advice to Horizons Regional Council for a consent application for the construction of a proposed pedestrian and cycle bridge across the Manawatu River. This included a review of the consent application, preparation of evidence, and hearing attendance. **Outputs:** Hearing evidence.

## Wellington ICMP Ecological Assessments –

Alex has continued ecological assessments for Wellington Water Limited to support ICMP development in Wellington city. In the last year, he completed assessments for the Evans Bay and South-east Coast ICMP catchments and is currently working on the Lyall Bay and Island Bay-Houghton Bay ICMP catchments. These assessments are locating Wellington's remnant open streams many of which are effectively 'hidden' from public (and regulatory) awareness, even though they may still support freshwater biota. **Outputs:** Reports and GIS datasets.



**Dudley Creek Remediation** – The remediation of Christchurch’s Dudley Creek continues at pace with contractors nearing completion of the stormwater overflow and works in the main stem of the creek and now moving into the last two sections in the St Albans and Shirley drains. The completed sections are looking good with the native plantings really taking off and we are seeing signs of fish moving into the areas of enhanced habitat (and made to feel welcome by the guys from Knight Construction – see photo). EOS Ecology technicians are regularly on site for rescue/recovery of fish during in-stream works, and Shelley and Nick continue to provide advice and guidance to the contractors to get the best possible ecological outcomes for the project, helped greatly by guys on site who are enthusiastic and invested in getting a good result. Chatting to locals we have had an overwhelmingly positive response to what is shaping up to be a great asset for their area, both for its natural/aesthetic value and for protection from future flood events.

**Outputs:** Fish recovery reports.

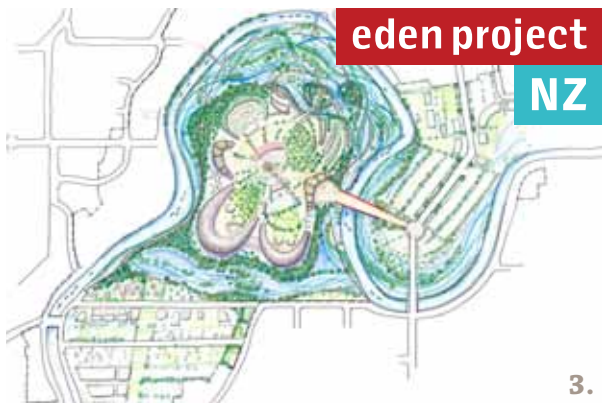
**SOE macroinvertebrate processing** – Emily, Nick, and Siobhán have been processing over 500 freshwater macroinvertebrate samples for six North Island regional councils to contribute to SOE reporting. **Outputs:** Invertebrate data to be incorporated into SOE reports. ■



1.



2.



3.



4.



5.



6.

1. Kirsty with students on field trip to local waterway. 2. Examples of EECE inanga resources; board game, maze, colouring-in. 3. Draft plan for Eden Project NZ. 4. Nick overseeing construction at Dudley Creek. 5 & 6. Nick and Emily measuring and catching at Kaputone Creek.

Photo © EOS Ecology



**New:** Andree Hickey-Elliott (MEnvMgt), Adam Purcell (MSc), Christine Ulrich (PhD candidate)

Our freshwater ecology team has been busier than ever over the past year undertaking fish, invertebrate, and habitat assessments in freshwater ecosystems. The bulk of our work has consisted of:

- undertaking environmental assessments, mitigation, and offsetting procedures for road construction projects, including baseline surveys and fish translocations,
- monitoring of effects of wastewater treatment plants and water abstraction on stream ecosystems,
- ecological assessments for various resource consent applications.

The team has also enjoyed action-packed team building exercises at Waitomo Caves and Rotorua Canopy Tours.

## Fish Translocations in Waikato Streams Impacted by the Construction of the Waikato Expressway

– The Waikato Expressway is being developed from Cambridge through to Hampton Downs. The works associated with the construction of the Expressway require the diversion of many waterways within the works footprint. Working as the project ecologists in the Hamilton and Longswamp sections of the Expressway construction, Kessels Ecology has translocated 676 indigenous fish, including 390 individuals of ‘At Risk’ species. **Staff involved:** Andree Hickey-Elliott, Jen Price, Christine Ulrich, Brenda Bartels and Adam Purcell. **Collaborators:** City Edge Alliance, Downer, Waikato-Tainui Tangata Whenua Working Group.

## Ecological Monitoring of Wastewater Treatment Plants in Coromandel Streams

– If not sufficiently treated, discharges from wastewater treatment plants can significantly degrade the ecological integrity of streams. Last summer, Kessels Ecology completed surveys of water and habitat quality of the environments downstream of several wastewater treatment plants. We provided recommendations for future management of the discharges and monitoring protocols. **Staff involved:** Adam Purcell, Jen Price, Brenda Bartels and Andree Hickey-Elliott. **Collaborators:** Veolia, Thames-Coromandel District Council. **Outputs:** Reports on Onemana Wastewater Treatment Plant Environmental Assessment 2017, and Results of the Biological Survey of the Waikiekie Stream 2017.

## Mudfish Translocations from Semi-rural Drains in Newstead, Hamilton

– A target species of our fish salvage work is the At Risk, Declining black mudfish (*Neochanna diversus*). Recent fish recovery in a semi-rural drain in Ruakura, Hamilton, resulted in the capture and translocation of approximately 60 black mudfish. **Staff involved:** Jen Price, Andree Hickey-Elliott, Christine Ulrich, Callum Styles and Adam Purcell. **Collaborators:** Waikato District Alliance. ■

TOP LEFT: Wiea van der Zwan sets out plants for a Matahuru Papakainga Marae, Nikau Whanau Trust and Waikato River Authority community restoration project in the Matahuru Wetland area on the banks of Lake Waikare, Waikato  
TOP RIGHT: Waikiekie Stream.  
MIDDLE: Lake Wainamu near Bethells Beach.  
BOTTOM: Rings Beach, Coromandel.



A black mudfish being released into its new habitat after being translocated from a stream impacted by drain maintenance works near Hamilton.

Photo © Andree Hickey-Elliott



Wiea van der Zwan and Brenda Bartels measure a kōaro caught in a Coromandel Stream.

Photo © Jen Price





Photo © Jen Price



Photo © Andree Hickey-Elliott



Photo © Jen Price



Photo © Jen Price



Riverscapes has had a busy year, with the general theme being the kicking off of some long-term projects. These include planning for the Zealandia lower lake perch eradication (for Karori Sanctuary Trust), perch egg removal research in Wairarapa (for Wairarapa Moana), and the mudfish and pūweto long term wetland habitat monitoring programme in the context of crack willow removal (for DOC). Riverscapes bought a drone this year, crashed it fairly promptly, then bought a new one which is being used for recon work in wetlands, weed surveying, and just generally enjoying the coolness of seeing stuff from above.

Minor projects included writing the Restoration Plan for Carter Reserve (for DOC), leading GWRC's kākahi community

monitoring (in its third year!), perch spawning site surveys (for Wairarapa Moana), fish surveying (we were lucky to achieve a giant kōkopu Personal Best in Taupō Swamp; for QEII Trust and private clients), drone surveys (for DOC), SEVs (for private clients), consent monitoring (for councils), and bioblitz participation (for Rathkeale College).

As sidelines, Amber published a children's book on freshwater invertebrates – technically reviewed by Alex James (EOS Ecology), and featuring the amazing photos of the late Stephen Moore (Landcare Research). She also created a card game based on whitebait. Both are available from [www.papawaipress.co.nz](http://www.papawaipress.co.nz). ■



Amber McEwan installing Artificial Spawning Substrates (ASSs) in the ZEALANDIA lower reservoir to trial perch egg removal as a population manipulation tool.

Photo © Ashley Alberto



Amber McEwan's arm next to giant kōkopu in Taupo Swamp, Wellington.

Photo © Robyn Smith





Fyke net being set in Kaputone Creek.  
See article on page 38.

Photo © EOS Ecology

**New:** Dr Mandy Tocher (Senior Ecologist/Herpetologist)

It's been another busy year for Ryder, with interesting freshwater, marine and terrestrial projects taking us to diverse locations and environments. We've assisted clients with projects all over the country, ranging from large hydropower companies in the central North Island to commercial kina harvesters in Foveaux Strait. Our drone is proving very useful for capturing the 'bigger picture', such as understanding the connections between river braids and observing how discharge plumes mix in the receiving environment. We've also enjoyed being involved with several community-focussed projects, including at the Orokonui Ecosanctuary near Dunedin and the Touchstone Project in Wanaka. Greg made a trip overseas in April (with staff from Environment Canterbury, Fish and Game, and others) investigating fish screening technologies in use in North America. Less enjoyable was clearing out drains during the Dunedin flood in July. We're all looking forward to getting out and about again this summer, with new adventures awaiting. Watch this space.

## Relocation of Threatened Species

**Throughout Otago** – Successfully capturing and relocating threatened fish (e.g., roundhead galaxias, Eldon's galaxias) and freshwater crayfish from streams prior to instream works (e.g., road widening, farm channels). **Staff Involved:** Ben Ludgate, Ruth Goldsmith, Mark Sanders and Nicola Pyper.

## Ecological Impact Assessment of Recreational Canyoning

– Assessment undertaken for a guided canyoning concession application near Queenstown, looking at the potential effects of canyoning on migrating fish.

**Staff Involved:** Ben Ludgate and Ruth Goldsmith.

## Orokonui Ecosanctuary Fish Passage

– Investigating opportunities for improving fish passage at Orokonui Ecosanctuary culverts while still preventing mammalian predators from entering. **Staff Involved:** Ben Ludgate and Ruth Goldsmith. **Collaborators:** Fluent Solutions.

## Lindis River Flow Investigations

– Investigating fish passage opportunities using 'critical riffle analysis', and the effect of surface flow and groundwater inputs on water temperature in the Lindis River. **Staff Involved:** Greg Ryder and Ruth Goldsmith. **Collaborators:** Otago Regional Council and Matt Hickey (Water Resource Management Ltd).

## Clutha River Ecological Surveys

– Ecological assessments of periphyton and macroinvertebrate communities in the non-wadeable habitat of the lower Clutha River. **Staff Involved:** Ben Ludgate, Brian Stewart, Nicola Pyper, Shannon Goodwin, Zoe Henderson and Justine Uytendaal.



Lake Pukaki.  
Photo © Greg Ryder





Kōura infested with flatworms.

Photo © Ben Ludgate



Otago Peninsula man Greg Ryder digging gravel out of a small lake, trying to clear the drain which is flooding the road. He says he should be able to find it after living here for 25 years, but there is just so much water and gravel he can't locate it.

Photo © Radio New Zealand/Ian Telfer



Elton Smith (Orokonui Ecosanctuary) demonstrating how the flood-gate operates at the Orokonui Stream triple culvert.

Photo © Ruth Goldsmith





**John and Yvonne Stark** have continued offering specialist freshwater ecological research and consulting services (primarily concerned with macroinvertebrates, biotic indices, and biomonitoring) and undertaking macroinvertebrate sample processing, since establishing Stark Environmental Limited in June 2007. SEL employs four part-time staff to assist with sample processing when the work load demands.

In the past year to date we have processed 650 macroinvertebrate samples for 16 different clients from throughout New Zealand, and prepared eight client reports. Most recent reports have been concerned with consent biomonitoring with two exceptions: MCI trends for 47

sites from Horizons Regional Council's SOE monitoring programme, and the development of an MCI for Northland's soft-bottomed streams. In the last few years sample processing has comprised an increasing percentage of our work load, with clients in the past year including regional councils (eight), consulting engineers (two), other environmental consultancies (four), and industry (two).

Although we are nearing pensionable age (in a few years' time) we have no plans to retire, and have recently purchased a third stereo-microscope to improve efficiency in our laboratory. ■

## Thomas Consultants



**New staff:** Dean Bradley, Douglas Faulkner

Our Principal Ecologist and wetland specialist **Melanie Dixon** was re-elected a Trustee of the National Wetland Trust at their Annual General Meeting on 29 August 2017 in Te Awamutu. Her recent wetland work includes a review of mangrove removal for a Local Board in South Auckland and reviewing various wetland related consents for Greater Wellington Regional Council. Melanie has also been assisting Auckland Council to develop regional freshwater attributes as part of their response to the National Policy Statement for Freshwater Management.

**Dean Bradley** joined the company as a hydrogeologist with experience monitoring river health, chemistry and flow, and modelling chemistry and water/gas interactions for geothermal springs, lakes and streams.

**Douglas Faulkner** also joined the team bringing expertise from river surveys for large projects in the US.

We continue to work on various projects for council, private landowners, community groups and developers. Below is a selection of a few of our recent projects.

### Freshwater Policy Project Execution Plan

— This project involved working with the Auckland Council Stormwater and RIMU team Freshwater Subject Matter experts to outline the development of additional attributes for Auckland Council's response to the National Policy Statement for Freshwater Management. **Outputs:** Project Execution Plan.

### Ecology Reviews for Auckland Council & Greater Wellington Consents

— We continue to provide ecology assessments on behalf of Auckland and Greater Wellington councils for resource consent applications across the Auckland region, and for expert advice for wetlands in the Greater Wellington region. **Staff Involved:** Melanie Dixon, Elizabeth Morrison, Michelle Tyrrell, Sharen Graham and Samantha Sutherland. **Outputs:** Ecology Peer Review reports and condition recommendations.

### Ecological Assessments & Restoration Plans

— These continue to be a key part of our service to private landowners, developers and council alike to support their land use consent applications and guide restoration activities for bush wetland and riparian areas. **Staff Involved:** Melanie Dixon, Elizabeth Morrison, Michelle Tyrrell and Samantha Sutherland.

### Regional Wetland Biodiversity Monitoring Programme – Wetland & Forest Monitoring & Te Henga Wetland Monitoring

— As part of Auckland's State of Auckland monitoring report card a number of wetlands in the Auckland Region are monitored on a 5-yearly cycle. We continue to be involved on a yearly basis, assisting as lead botanists and field crew for wetland monitoring and forest monitoring. This year we also repeated the plots in Te Henga Wetland that we completed the plot setup for in 2012. **Staff Involved:** Samantha Sutherland, Melanie Dixon, Elizabeth Morrison and Amanda Kirk. ■



Mangere Stream – a very degraded stream with anaerobic soils and mosquito fish. The comment from our freshwater taxonomist was ‘Congratulations, you have sent me the stinkiest sample I have ever had to endure!’

Photo © Thomas Consultants



Te Henga Wetland monitoring for Auckland Council, April 2017.

Photo © Thomas Consultants





**Richard Allibone** has been working on a range of projects, the majority associated with water abstraction, including ecological flow assessments for councils, investigations into the ecological effects of irrigation schemes, the presentation of expert evidence at resource consent hearings for water abstractions, and conducting resource consent technical reviews for Otago Regional Council. He has also been working with government departments – the Ministry for Primary Industries (providing fisheries advice to the National Environmental Standard for Plantation Forestry) and DOC (writing an introduction to the Department’s Freshwater Inventory and Monitoring toolbox module, and participating in the Waituna Creek restoration project). Additional projects include working on a marina development project at Lake Wanaka, and elver trap and transfer projects in Marlborough.

**Transmission Gully Motorway** – I have been continuing in the role of providing independent advice to the TG construction consortium and Greater Wellington Regional Council with regard to fish passage, environmental management and compensation, stream diversion designs and aquatic monitoring.

**Manuherikia Alpine Galaxias Spawning & Distribution** – The Manuherikia alpine galaxias occurs upstream of Falls Dam in a braided section of the Manuherikia River, the lower part of which will be flooded if Falls Dam is raised. A spawning study was commenced in August 2016 and a water temperature monitoring project was run from August 2016 to April 2017. The water temperature study found that summer water temperatures exceed the temperature tolerance of Canterbury alpine galaxias, which implies that water temperature is limiting the distribution of the Manuherikia alpine galaxias. However, the galaxiid’s distribution is also influenced by habitat and salmonid interaction effects. **Outputs:** Allibone, R.M. (2016). Insights into the biology of the rare fish, the Manuherikia alpine galaxiid. Presentation at New Zealand Freshwater Sciences Society annual conference, Invercargill (December 2016).

**Ecological Flow Assessments** – Ecological flow assessments have been undertaken for Environment Canterbury in the Ashley River and four spring fed tributaries, and for Otago Regional Council in the Fraser River and Bannock Burn in Central Otago. These studies feed into the minimum flow and water allocation limits processes that both councils are undertaking. ■



Black fronted tern feeding in the Manuherikia River.

Photo © Richard Allibone



Brook char fry resting in a backwater, Manuherikia River, October 2017.

Photo © Richard Allibone





St James walkway.

Photo © Angus McIntosh





Children from the Oxford Playcentre group helped translocate kōwaro (Canterbury mudfish) to a wetland, as part of the Kids for Kōwaro project.



# NON-PROFIT ORGANISATIONS

## Working Waters Trust

**New:** Kelly Body, Rose Phillips



As usual, we have had a diverse year of community events, monitoring, restoration works, talks and education sessions, with huge rewards and even some awards. Thanks to everyone who helps make the magic happen! **Sophie Allen**, the Projects Manager based in Christchurch, has continued the Trust's focus on Canterbury and Otago freshwater conservation and restoration projects with some nationwide projects, advocacy and submission writing. Some highlights of the year were surveying for the rare freshwater mussel (*Echyridella onekaka*) in Golden Bay, and working with New Zealand Post on a stamp series profiling threatened native freshwater fish. **Rose Phillips** has been helping with mapping and technical hydrological advice. **Kelly Body** has continued to contribute her wonderful artistic talents to create fun teaching resources. Trustee, **Lan Pham**, has had a fascinating year after election to Environment Canterbury as a councillor. **Emerson Yeoman** has returned to a role at the Christchurch City Council after a year on Raoul Island, **Matt Wylie** has weathered out this last year to complete his PhD on hapuku (groper), and **Nicki Atkinson** has started working for DOC as a Freshwater Technical Advisor.

**Kids for Kōwaro** – This year we kicked off a pilot project that connects primary school students with the kōwaro (Canterbury mudfish), allowing them to take action to protect and care for this Nationally Critical species. Actions have included species translocation, monitoring, and engaging with the school's local community around freshwater conservation. The project has been run in partnership with Enviroschools Canterbury, with funding from the Rāta Foundation and a DOC Community Conservation Award **Outputs:** Two translocations of Canterbury mudfish, collation of a fit-for-purpose teaching resource—using the 'Action Learning Cycle', news stories.

**New Zealand Native Freshwater Fish Stamp Series** – This project was initiated by Working Waters Trust, led by New Zealand Post with technical input from Stella McQueen, as a way to raise the profile of our freshwater fish, particularly threatened species, to the general public. After many stamp editions of our native birds, finally it was time for our fish! **Outputs:** New Zealand Native Freshwater Fish stamp series – released March 2017, with five stamps (lowland longjaw galaxias, redfin bully, longfin eel, lamprey and torrentfish), first day cover and collectors packs.

**Middelmost Wetland Project** – In our first year of this project we have fenced off a 2.6 ha area, and kicked off wetland habitat extension through earthworks and wetland plantings, and riparian planting alongside two spring areas. Monitoring of Canterbury mudfish and waterfowl has been carried out together with school groups and community volunteers. The project is run in partnership with Forest and Bird North Canterbury Branch, with funding from Environment Canterbury and WWF New Zealand (through the Tindall Foundation). ■



Working Waters Trustees Lan Pham and Sophie Allen holding an arts'n'crafts stall at the Te Kōhaka o Tūhaitara Open Day, North Canterbury, November 2016.



New Zealand Native Freshwater Fish stamp series initiated by Working Waters Trust, released March 2017.

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# CONFERENCES

## New Zealand Freshwater Sciences Conference 2017



**NZ FRESHWATER SCIENCES SOCIETY ANNUAL CONFERENCE**  
**19-24 NOVEMBER 2017**  
**HAMILTON, NEW ZEALAND**

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)

This year the NZ Freshwater Sciences Society annual conference is joining forces in Hamilton with the IPENZ/Water NZ Rivers Group, the International Society for River Science (ISRS; [riversociety.org](http://riversociety.org)). Previous ISRS conferences have been held in Berlin, Beijing and La Crosse so having their 5th biennial symposium in New Zealand, with the assistance of the Waikato River Authority, will be a highlight of the conference. Over 100 international speakers, including several well-known plenary speakers, will be attending the conference providing New Zealand researchers with a unique opportunity to showcase their work to some of the world's leading river scientists.

**Register online at [www.imav2017.com](http://www.imav2017.com)**

### HIGHLIGHTS

We have lined up some fantastic social functions and events during the conference, including:

- Pre-Conference Workshops
- Pōwhiri (welcome ceremony) at Tūrangawaewae Marae
- Mix & Mingle at Claudelands
- Poster Session
- Student Function at the Roaming Giant
- Conference Dinner at Hamilton Gardens
- Eight Field Trips showcasing a range of projects and sites around the Waikato Region



### CONFERENCE THEME

#### INTEGRATING MULTIPLE AQUATIC VALUES (IMAV)

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 value 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 delegates from physical, natural, and socio-economic sciences, as well as those who manage, create policy for and use riverine resources and their associated aquatic environments.

**Contact: On-Cue Conferences**  
Phone: +64 3 5466330  
Email: [lea@on-cue.co.nz](mailto:lea@on-cue.co.nz)  
[www.on-cue.co.nz](http://www.on-cue.co.nz)

**For further information**  
Visit: [www.imav2017.com](http://www.imav2017.com)

## New Zealand Freshwater Sciences Conference 2018

The 2018 NZFSS Conference will be held in Nelson, 10–14 December, 2018. More information will be available on our website ([www.freshwater.science.org.nz](http://www.freshwater.science.org.nz)) and on Facebook ([www.facebook.com/NZFSS](https://www.facebook.com/NZFSS)) closer to the time! ■

Dry Stream, Porters Pass, Canterbury

Photo © @shannan\_crow

# AWARDS





# New Zealand Freshwater Sciences Society

## Medal Recipient 2015

### Clive Howard-Williams

In 2015, Clive Howard-Williams was awarded the NZFSS Medal for his outstanding contributions to the understanding and management of freshwaters. Before arriving in New Zealand from South Africa in the 1970s, Clive was already a well-known limnologist for the work he had done on the ecology of macrophytes of South African lakes. In New Zealand, Clive continued to carry out research on aquatic macrophytes, but also branched out into other aspects of freshwater science and management, eventually also being a major contributor to research programmes on Antarctic lakes. In the past 23 years, Clive has held key strategic and management roles in the National Institute of Water and Atmospheric Research and in these capacities has contributed greatly to government policy on freshwater and estuarine ecosystems. In recognition of his achievements, he has

been awarded the New Zealand Science and Technology Silver Medal and was elected a Fellow of the Royal Society of New Zealand. He has also held important positions in many international science organisations and has on many occasions been visiting scientist and professor at overseas universities and research institutes. No doubt contributing to Clive's great achievements and successes so far in his career have been his enthusiasm, his positivity and his courage to work across disciplines and across science, management and policy realms. Congratulations, Clive, on very deservedly winning this highest award that our Society bestows for contributions to freshwater science and management. ■

# New Zealand Freshwater Sciences Society

## Medal Recipient 2016

### John Hayes

John Hayes is the recipient of the NZFSS Medal for 2016. John is one of the most respected and influential salmonid researchers in New Zealand, where he has worked on various aspects of salmonid biology and ecology since gaining his PhD from Canterbury University in 1984. John is a Senior Scientist in the Coastal and Freshwater Group at the Cawthron Institute, where he is somewhat of a mentor and inspiration to many of the younger scientists working there. John is firmly committed to ensuring that his research directly informs management decisions and he has won the respect of a wide range of stakeholders – from conservationists to power companies – for his deep knowledge of fishery science and management and his unwavering professionalism. John's research on salmonids has been internationally recognised and honoured by the receipt of the award (with co-authors)

for best paper in the *Transactions of the American Fisheries Society* journal in 2000 and through coverage of his research in the *New Scientist* in 2001. While John's research forte is in salmonid bioenergetics and ecohydrology, one of his passions is trout fishing and he has been a generous sharer of his knowledge with non-scientists by being a frequent writer for fishing magazines and publishing a popular book called *The Artful Science of Fly Fishing* (co-authored with Les Hill) in 2004. Congratulations, John, on winning the NZFSS's most prestigious award for outstanding contributions to freshwater science and management. ■

Marc Schallenberg  
PRESIDENT

See [freshwater.science.org.nz/index.php/awards/nzfss-medal](http://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.

## 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 2017 S.I.L. Trust Travel Award was Brandon Goeller. The S.I.L. Trust Guest Lecturer Award was not awarded this year.

### **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](http://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](http://freshwater.science.org.nz/index.php/awards/sil-trust-fund-1987-travel-award) ■



# BUDGET FOR THE YEAR ENDED 30 JUNE 2016

## Statement of Financial Performance

New Zealand Limnological Society Incorporated  
For the year ended 30 June 2016

'How was it funded?' and 'What did it cost?'

Account	Notes	2016	2015* (Restated)
<b>Revenue</b>			
Donations, fundraising and other similar revenue	1	-	5,050
Fees, subscriptions and other revenue from members	1	17,736	17,431
Revenue from providing goods or services	1	91	274
Interest, dividends and other investment revenue	1	1,929	1,976
<b>Total Revenue</b>		<b>19,756</b>	<b>24,731</b>
<b>Expenses</b>			
Other Expenses	2	4,696	15,841
Grant, Donations and Awards Costs	2	3,335	7,722
<b>Total Expenses</b>		<b>8,031</b>	<b>23,563</b>
<b>Surplus/Deficit before Conference</b>		<b>11,725</b>	<b>1,168</b>
<b>Conference Revenue</b>			
Fees, subscriptions and other revenue from members		208,483	14,771
Donations, fundraising and other similar revenue		-	4,398
<b>Total Conference Revenue</b>		<b>208,483</b>	<b>19,169</b>
<b>Conference Expense</b>			
Conference Expenses	12	205,624	-
<b>Total Conference Expense</b>		<b>205,624</b>	<b>-</b>
<b>Surplus/(Deficit) from Conference</b>		<b>2,859</b>	<b>19,169</b>
<b>Total Surplus/(Deficit) for the Year</b>		<b>14,584</b>	<b>20,337</b>

\* The 2015 comparatives have been restated due to a prior period adjustment.  
See Note 11

This statement has been subject to Audit and should be read in conjunction with the accompanying Notes and attached Audit Report.

# Notes to the Performance Report

New Zealand Limnological Society Incorporated

For the year ended 30 June 2016

\* Restated

Account	2016	2015*
<b>1. Analysis of Revenue</b>		
<b>Fees, subscriptions and other revenue from members</b>		
Subscriptions - Current	17,049	15,992
Subscriptions - In Arrears	687	1,439
<b>Total Fees, subscriptions and other revenue from members</b>	<b>17,736</b>	<b>17,431</b>
<b>Revenue from providing goods or services</b>		
Sales - Book - Advances in NZ Freshwater Science	-	274
Sales - Book - Crustacea Identification Guide	91	-
<b>Total Revenue from providing goods or services</b>	<b>91</b>	<b>274</b>
<b>Interest, dividends and other investment revenue</b>		
Interest Income	1,929	1,976
<b>Total Interest, dividends and other investment revenue</b>	<b>1,929</b>	<b>1,976</b>
<b>Other revenue</b>		
Donations - Student Prizes	-	5,050
<b>Total Other revenue</b>	<b>-</b>	<b>5,050</b>

Account	2016	2015*
<b>2. Analysis of Expenses</b>		
<b>Other Expenses</b>		
<b>Stock</b>		
Opening Stock	-	8,805
Stock Write Off	-	8,655
Closing Stock	-	8,655
<b>Total Stock Expense</b>	<b>-</b>	<b>8,805</b>
Audit Fee	2,300	4,200
Bank Fees	611	582
General Expenses	35	449
Membership fees - RSNZ	1,200	1,200
Postage	143	124
Printing - Newsletter	408	481
<b>Total Other Expenses</b>	<b>4,696</b>	<b>15,841</b>
<b>Grant, Donations and Awards Costs</b>		
Awards - Best Student Paper	500	500
Awards - Jolly Student Travel	400	600
Awards - SIL Trust Conference Prizes	800	800
Donation - Gift to SIL Trust	1,635	5,822
<b>Total Grant, Donations and Awards Costs</b>	<b>3,335</b>	<b>7,722</b>

Account	2016	2015*
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### 3. Analysis of Assets

<b>Bank accounts and cash</b>		
Non Profit Org A/C	49,079	53,253
Term Deposit	55,536	53,207
<b>Total Bank accounts and cash</b>	<b>104,615</b>	<b>106,460</b>
<b>Debtors and prepayments</b>		
Accounts Receivable	20,908	5,910
Prepayments	5,000	5,000
<b>Total Debtors and prepayments</b>	<b>25,908</b>	<b>10,910</b>
<b>Other current assets</b>		
GST Receivable	586	-
Interest Accrued	288	819
<b>Total Other current assets</b>	<b>873</b>	<b>819</b>
<b>Account</b>	<b>2016</b>	<b>2015*</b>

### 4. Analysis of Liabilities

<b>Creditors and accrued expenses</b>		
Accrued Expense	2,400	2,100
Donation Owed to SIL Trust	4,689	2,837
<b>Total Creditors and accrued expenses</b>	<b>7,089</b>	<b>4,937</b>
<b>Other current liabilities</b>		
GST Payable	-	3,569
Subscriptions in Advance	122	83
<b>Total Other current liabilities</b>	<b>122</b>	<b>3,652</b>
<b>Account</b>	<b>2016</b>	<b>2015*</b>

### 5. Accumulated Funds

<b>Accumulated Funds</b>		
Opening Balance	109,601	89,264
Accumulated surpluses or (deficits)	14,584	20,337
<b>Total Accumulated Funds</b>	<b>124,185</b>	<b>109,601</b>
<b>Total Accumulated Funds</b>	<b>124,185</b>	<b>109,601</b>

### 6. Commitments

There are no commitments as at 30 June 2016 (Last year - nil).

### 7. Contingent Liabilities and Guarantees

There are no contingent liabilities or guarantees as at 30 June 2016 Last year - nil).

### 8. Related Parties

There were no transactions involving related parties during the financial year other than:

- Committee member subscriptions which are on the same terms as other members of the Society.
- Payment of donations to the SIL 1987 Trust \$4,389.

Account	2016	2015*
<b>12. Analysis of Conference Revenue and Expenses</b>		
<b>Conference Revenue</b>		
Sponsorship	38,913	-
Registration Fees	169,570	-
Net received in 2015	-	19,169
<b>Total Conference Revenue</b>	<b>208,483</b>	<b>19,169</b>
<b>Conference Expense</b>		
Venue Hire, Food, Accommodation and Other Expenses	36,679	-
Conference Management Fees	168,945	-
<b>Total Conference Expense</b>	<b>205,624</b>	<b>-</b>
<b>Net Conference Income</b>	<b>2,859</b>	<b>19,169</b>

Footnote: The Conference income is presented as net in the 2015 financial year

Account	2016
<b>13. Aged Subscriptions Receivable at 30 June 2016</b>	
0 to 1 Year	10,279
1 to 2 Years	4,400
2 to 3 Years	622
3 to 4 Years	239
<b>Total Aged Subscriptions Receivable</b>	<b>15,540</b>



In 1987, the New Zealand Limnological Society co-sponsored the 23rd Congress of the International Association of Theoretical and Applied Limnology (SIL). In 2002, surplus funds (\$45,500) raised from this conference were put into a trust (called "S.I.L. – 1987 Trust Fund"), which was established specifically to "advance and promote education and research in the scientific field of Limnology for the benefit of ...New Zealand". Five Trustees agreed to act as S.I.L. – 1987 Trust Fund Trustees. To reach the aim of the Trust, three objectives were listed, and these were (i) to send young New Zealand scientists to an overseas conference; (ii) to bring prestigious scientists to New Zealand; and (iii) to recognise the best student paper delivered at the annual conference. To enable the objectives to be met, a Trust Fund Awards Committee was also established, comprising one of the S.I.L. – 1987 Trust Fund Trustees, the President of the New Zealand Limnological Society, the Treasurer of the New Zealand Limnological Society, and two other members of the New Zealand Limnological Society elected during Society elections (held every two years). In each year that money is made available by the Trustees for purposes stated above, the Committee's tasks are to determine the winner of the Student Paper Award, invite and consider applications for travel and guest lecturer awards, and to recommend to the Trustees the number of awards to be made, the amount of each award, the recipient of each award, and other associated administrative tasks.

The Society is closely related to the Sil 1987 Trust fund, but the Trust is not controlled by the Society.

#### **The Sil 1987 Trust held the following balances:**

NZ bond at 19 August 2016	20,837
BNZ unit Trust at 17 June 2016	18,662
BNZ Term deposit at 17 June 2016	20,000
BNZ current account at 30 June 2016	6,750
<b>Total</b>	<b>66,249</b>

\* Amounts according to the closest dated statement available to 30 June 2016.  
These are not included within the asset balances of the Society.

#### **9. Events After the Balance Date**

There were no events that have occurred after the balance date that would have a material impact on the Performance Report (Last year - nil).

#### **10. Ability to Continue Operating**

The entity will continue to operate for the foreseeable future.

#### **11. Correction of Errors**

The entity has corrected its prior year comparatives for Donations owed to SIL Trust at 30 June 2015. This has resulted in an increase in the Donation to SIL Trust Liability Accrual of \$2,720. This has resulted in an increase to the Donation - Gift to SIL Trust Expense by the same amount which in turn has reduced the profit reported at 30 June 2015 by \$2,720

# Statement of Financial Position

New Zealand Limnological Society Incorporated  
As at 30 June 2016

'What the entity owns?' and 'What the entity owes?'

Account	Notes	2016	2015* (Restated)
<b>Assets</b>			
<b>Current Assets</b>			
Bank accounts and cash	3	104,615	106,460
Debtors and prepayments	3	25,908	10,910
Other Current Assets	3	873	819
<b>Total Current Assets</b>		<b>131,396</b>	<b>118,189</b>
<b>Total Assets</b>		<b>131,396</b>	<b>118,189</b>
<b>Liabilities</b>			
<b>Current Liabilities</b>			
Creditors and accrued expenses	4	7,089	4,937
Other current liabilities	4	122	3,652
<b>Total Current Liabilities</b>		<b>7,211</b>	<b>8,589</b>
<b>Total Liabilities</b>		<b>7,211</b>	<b>8,589</b>
<b>Total Assets less Total Liabilities (Net Assets)</b>		<b>124,185</b>	<b>109,601</b>
<b>Accumulated Funds</b>			
Accumulated surpluses or (deficits)	5	124,185	109,601
<b>Total Accumulated Funds</b>		<b>124,185</b>	<b>109,601</b>

This statement has been subject to Audit and should be read in conjunction with the accompanying Notes and attached Audit Report.



# Statement of Cash Flows

New Zealand Limnological Society  
Incorporated  
For the year ended 30 June 2016

'How the entity has received and used cash'

Account	2016
<b>Cash Flows from Operating Activities</b>	
Fees, subscriptions and other receipts from members	7,559
Receipts from providing goods or services	2,491
Payments to suppliers and employees	- 13,916
<b>Total Cash Flows from Operating Activities</b>	<b>- 3,866</b>
<b>Cash Flows from Investing and Financing Activities</b>	
Transfer to term deposit	- 2,329
Interest receipts	2,021
<b>Total Cash Flows from Investing and Financing Activities</b>	<b>- 308</b>
<b>Net Increase/ (Decrease) in Cash</b>	<b>- 4,174</b>
<b>Cash Balances</b>	
Cash (excluding term deposit) at beginning of period	53,253
Cash and cash equivalents at end of period	49,079
<b>Net change in cash for period</b>	<b>- 4,174</b>

This statement has been prepared without conducting an audit or review engagement, and should be read in conjunction with the attached Compilation Report.

# Statement of Accounting Policies

New Zealand Limnological Society Incorporated

For the year ended 30 June 2016

**'How did we do our accounting?'**

## **Basis of Preparation**

The entity has elected to apply PBE SFR-A (NFP) Public Benefit Entity Simple Format Reporting - Accrual (Not-For-Profit) on the basis that it does not have public accountability and has total annual expenses equal to or less than \$2,000,000. All transactions in the Performance Report are reported using the accrual basis of accounting. The Performance Report is prepared under the assumption that the entity will continue to operate in the foreseeable future.

## **Goods and Services Tax (GST)**

The entity is registered for GST. All amounts are stated exclusive of goods and services tax (GST) except for accounts payable and accounts receivable which are stated inclusive of GST.

## **Income Tax**

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

## **Bank Accounts and Cash**

Bank accounts and cash in the Statement of Cash Flows comprise cash balances and bank balances with original maturities of 90 days or less.

## **Inventory**

Inventory is valued at the lower of cost and net realisable value. Inventory is sold on a first in first out basis

## **Receivables**

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



## **Revenue**

### **Subscription Revenue**

The subscription revenue is due from the members in July of each year to cover the period from July to June of the following year. Subscription revenue is recognised in the year which the service is provided to members and unpaid subscriptions are recognised as a receivable at year end

Subscriptions paid in advance during the year are recognised as Income in Advance in the Statement of Financial Position

### **Interest**

Interest revenue is recognised as it is earned

### **Conference Revenue**

Conference Revenue is recognised on a gross basis, when the entity has primary responsibility for the conference, and has exposure to significant risk and reward.

## **Changes in Accounting Policies**

The society transitioned on 1 July 2015 from preparation of General Purpose information in accordance with New Zealand Generally Accepted Accounting Policies (NZ GAAP) to Public Benefit Entity Simple Format Reporting – Accrual (Not-For-Profit). The transition had minimal impact on existing accounting policies of the society

# Approval of Financial Report

New Zealand Limnological Society Incorporated  
For the year ended 30 June 2016

The Governing body are pleased to present the approved financial report including the historical financial statements of New Zealand Limnological Society Incorporated for year ended 30 June 2016.

APPROVED

Committee



Date

10 October 2017

Committee



Date

10 October 2017



# MINUTES OF THE 49<sup>TH</sup> 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 2017 AGM]

Held at Ascot Park Hotel, Invercargill, Tuesday 6 December 2016

The Annual General Meeting commenced at 5:35 pm and was chaired by Marc Schallenberg, President.

Present: Marc Schallenberg, President; Janine Wech, Secretary-Treasurer, and 59 members.

### 1. Apologies

Vivienne Cassie-Cooper, Natasha Grainger, Amber Sinton

### 2. Minutes of the 48th 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 48th AGM.

(Gerry Closs / Natasha Petrove – carried)

### 3. President's Report [Marc Schallenberg]

I'd like to thank the members of our Executive Committee, and especially our Secretary/Treasurer Janine Wech, who have so ably helped guide the Society through another busy year. From my perspective at the end of 2016 the NZFSS is a vibrant organisation that increasingly engages with Government on policy issues and promotes freshwater science to the public. The Invercargill conference has over 300 delegates, which exceeds the predictions made by the conference organisers. These factors, together with the excellent standard of the conference presentations and posters convinces me that our Society is in excellent standing at the end of 2016. The Treasurer's report shows that we are also in excellent financial standing.

#### 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."
- Press release and follow up radio, TV and print media attention concerning the NZFSS response to Jacqueline Rowarth and Doug Edmeades' assessment of the water quality of the Waikato River (thank you to the Exec and select members of NZFSS who helped produce the press release).

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

The Society has also co-published the book, *Advances in Freshwater Science*, which is an update of the 2004 book, *Freshwaters of New Zealand*.

#### INDEPENDENT REVIEW OF NOF PROCESSES & GUIDELINES

At last year's AGM, we discussed the possibility of producing an independent review of the NOF (National Objectives Framework) process and guidelines. 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. from discussions with MfE and Alastair Bisley, it appeared that lessons had been learnt about shortcomings of the initial NOF process of engagement with freshwater scientists (which had left some of our members frustrated and disappointed).

## MEMBERSHIP ON THE LAND AND WATER FORUM (LAWF)

This year NZFSS was invited to become a member of the Land and Water Forum, which demonstrates the value and esteem which 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.

## NZFSS ELECTIONS

This AGM marks the end of another cycle of service by NZFSS Exec office-bearers and co-opted members. Our Secretary/Treasurer, Janine Wech, will be stepping down from the role which she held for many years. Janine will be sorely missed because she has been a fastidious, hardworking, and very helpful Secretary/Treasurer. Thank you so much for all you have done, Janine.

In addition, our student rep, Simon Stewart, our two Māori reps, Hannah Rainforth and Mahuru Robb, and our assistant newsletter editor, Natasha Petrove, will be stepping down from their roles. I thank them all for their work on the Exec over the past two years.

Earlier this year, our webmaster, Jay Piggott, stepped down. We appreciate all the work Jay did over the years to help develop and run our website and our email bulletin. We will miss his helpfulness and his IT expertise.

The other Exec members are happy to stand again for office in this election.

My first term as president is also coming to an end. Being president of the NZFSS has been a challenging and also very rewarding role for me. I greatly appreciate the support of the society in giving me the opportunity and the Exec for supporting me in the role.

## THANK YOUS

I'd also like to thank Kate McArthur for her hard work on our submissions, who was ably assisted by Richard Allibone. Thank you's also go out to Kati Doehring and Natasha Petrove for producing another excellent newsletter for us. And thank you to Lisa Carlin, who first assisted Jay with IT tasks and then took on Jay's role once he stepped down.

I also have really appreciated advice and ideas offered on many occasions by our immediate past President, David Hamilton, and also by Phil Jellyman.

And finally, thank you to all our members who have sent us material for submissions, suggestions, supportive letters over the year. All these communications are greatly appreciated and help us keep in touch with the Society between conferences.

*Motion:* I move from the Chair that this report be accepted.  
(Kate McArthur – carried)

## 4. Secretary-Treasurer's Report [Janine Wech]

### FINANCES

The accounts for the 2015-2016 financial year are still with the auditors Crowe Horwath in Blenheim. I'll send out the final

financial statements to all members once I receive them, for your approval. Income and expenditure figures are GST-exclusive.

**Our total assets** as at 30 June 2016 was \$104,900, and includes our Term Deposit (\$55,820).

Unsold stock of "The Guide to the Freshwater Crustacea of New Zealand" is no longer included in our asset calculation (on advice from the auditor, as it is slow moving inventory), although any sales are still included as income.

**Income** earned for the 2016 financial year came from the 2015 Lower Hutt conference (\$2,859), subscription income (\$7,374), interest earned from our term deposit and current account (\$1,960), and sales from the book "The Guide to the Freshwater Crustacea of New Zealand".

**Main expenditure** items for the 2016 financial year included the Award for the Best Student Paper (\$500), and Jolly Student Award (\$400; four students applied). Expenses also included Audit costs (\$2,000), RSNZ membership fees (\$1,200), hardcopy newsletter and postage expenses (\$550), and bank fees (\$610). A payment of \$5,000 was also made as the Seed Fund for the 2016 conference.

The Society made a net surplus of \$1,225 for the year ended 30 June 2016. This compares to a surplus of \$23,000 for the 2015 financial year.

Reasons for this difference include:

- Conference income for the 2015 financial year was \$14,771.
- No subscription invoices went out to members in 2015-2016. A recommendation from Crowe Horwath was to get subscriptions sent out early in the financial year (and this is also part of our Constitution). These subscription invoices were included in the invoices recently sent out to members for the 2016-2017 year, and for which we have had a good response from, to date.

## MEMBERSHIP

Membership by member type shows the breakdown of our membership regardless of financial status below. This shows that waged and student member numbers are relatively stable over the last 4 years. The database is due a clean-up which is why the numbers are a little higher this year.

### Membership as at November 2016 – Member Type

	2016	2015	2014	2013	2012
Ordinary	384*	337	326	345	329
Unwaged/ Student	122*	113	108	13	13
Honorary	9	9	9	10	10
Life	4	4	4	4	4
Other (Societies)	5	5	5	125	112
Corporate (Libraries)	11	11	9	5	5
TOTAL	535	479	464	502	473

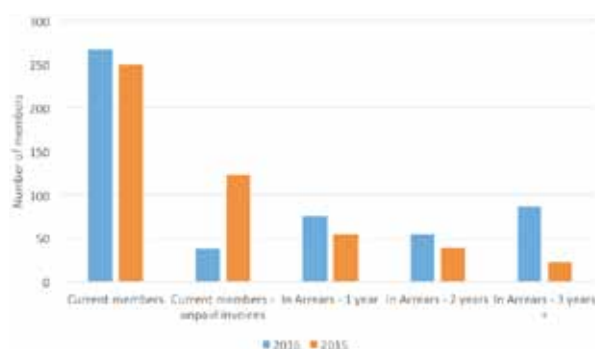
\* Includes members whose subs are in arrears > 3 years. The database is due a clean-up.

The graph below shows the financial status of members as at the end of November this year, compared to last year.

The recent membership subscription renewal requests has been tremendous, with a lot of subs in arrears brought up to date, so thank you everyone.

The number of members in arrears by 3 years is creeping up again, and reflects members who we have lost contact with, or who may have moved away from freshwater science and have not resigned from the Society, or who are active in the Society but keep forgetting to pay their subs. This will be tidied up during the next month.

#### Financial status of members as at November, comparing 2016 and 2015.



*Motion:* That the Society accounts for 2015-2016 be accepted.

(Janine Wech / Kate McArthur – carried)

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

(Janine Wech / Gerry Closs – carried)

## 5. SIL 1987 Trust Fund Report [Kit Rutherford]

See Table below.

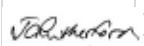
*Motion:* That the SIL 1987 Trust Fund report for 2015-2016 be accepted.

(Kit Rutherford / Brendan Hicks – carried)

## 6. Election of Society Officers

The following officers were nominated and duly elected:

- President: Nominations – Marc Schallenberg  
(Kevin Collier / Kit Rutherford)  
– *Motion:* Nominations close  
(Carolyn Burns / Phil Jellyman)
- Secretary-Treasurer: Nominations – Amy Whitehead  
(Simon Stewart / Sophie Allen)  
– *Motion:* Nominations close  
(John Quinn / Brendan Hicks)
- Newsletter editor: nominations – Natasha Petrove  
(Sophie Allen / Kate McArthur)  
– *Motion:* Nominations close  
(Simon Stewart / Phil Jellyman)

SIL 1987 Trust		Financial Statement 3rd December 2016						
		Account number	Maturity	Interest	Amount			
31/09/2015	NZ Bond Trust	22/11/4122			\$ 19,664			
17/09/2015	BNZ Ready Money	02 0343 0048 153 000			\$ 6,788			
17/09/2015	BNZ Term deposit	9348153-01006			\$ 10,000			
17/09/2015	BNZ Term deposit	9348153-01007			\$ 10,000			
17/09/2015	AMP Int. Equity Trust	22/09/6373			\$ 20,192		change	
<b>TOTAL ASSETS at FY ending 30th September 2015</b>					<b>\$ 66,644</b>			
30/09/2016	AMP (AIT)	NZ Fixed Interest Trust	S335382		\$20,756		\$1,092	see Note 2
17/11/2016	BNZ Ready Money	02 0343 0048 153 000			\$9,099		\$2,311	
17/09/2015	BNZ Term deposit #1	9348153-01006	12/09/2016	4.25%	\$10,000		\$0	
17/09/2015	BNZ Term deposit #2	9348153-01007	12/09/2017	4.40%	\$10,000		\$0	
17/11/2016	AMP Int. Equity Trust	1633996			\$19,094		-\$1,097	see Note 3
<b>TOTAL ASSETS at 30th November 2016</b>					<b>\$68,949</b>		<b>\$2,305</b>	
Net increase in investments					\$2,305			
Net income					\$4,769	donations & interest		
5% of assets					\$3,447			
<b>Available for awards in 2017</b>					<b>\$10,522</b>			
<b>Income/expenditure</b>						expenditure	income	
19/10/2016	Award	Stewart			-\$1,600	-\$1,600		
14/10/2016	NZFSS	student prizes			-\$800	-\$800		
15/08/2016	NZFSS	Donations 2016			\$1,852		\$1,852	
15/08/2016	NZFSS	Donations 2015			\$2,537		\$2,537	
monthly	BNZ	bank fees			-\$58	-\$58		
12/09/2016	BNZ	interest TD #1			\$380		\$380	see Note 1
<b>NETT</b>					<b>\$2,311</b>	<b>-\$2,458</b>	<b>\$4,769</b>	
<b>Notes</b>								
1. Interest TD #2 not yet received. Assessed at circa \$440								
2. NZ Bond Trust converted to AMP NZ Fixed Interest Trust (AIT) on 18/8/2016								
3. Decrease in unit price								
								
Treasurer								
3rd December 2016								



## 7. Co-opted Members

The following members have kindly offered their time to assist as co-opted members:

- Lisa Carlin – Website Manager
- Kati Doebling – Website Editor
- Student Representative – Emma Moffett
- Ian Kusabs – Māori Representative
- Tara McAllister – Māori Representative
- Marine Richardson – Assistant Newsletter Editor
- Rich Allibone – Advocacy / Submissions Manager
- Sophie Allen – Community Outreach

## 8. Future Planning for the Society

Marc Schallenberg circulated briefing notes to members prior to the AGM for members to consider prior to the meeting. The notes were then discussed.

- What to do with the NZFSS growing cash reserves?
  - Carolyn Burns: Host an international guest to go out to smaller centres (e.g. Nelson, Gisborne) and give talks, speak to communities (would involve airfares, etc.)
  - Jenny Webster-Brown: Sponsor a national lecturer tour of one of our own members to go out to NZ centres meet with community
  - Marc Schallenberg: the two could be linked, so sponsor an international guest and NZFSS member.
  - Jane Kitson: Use for succession planning and getting the home community to attend conferences. Use growing reserves to strengthen the society, support students, support middle layer of scientists and scientists in the community.
  - Richard Measures: Invite participation from developing countries; interact and invite a member from similar organisations to attend NZFSS conference.
  - John Quinn: Fund a restoration project and have a public focus day, inviting members of the public. Also encourage networking with other societies / affiliation with other societies.
  - Jon Harding: Ensure some reserves, but have a plan about how much money is available to spend each year. Generating Society books is a good idea, even though it's a loss leader.
  - Erron Henderson: Agrees with Jon Harding about having rainy day fund and also planning to spend funds during a financial period. Also agrees that members could be funded to write and publish forward-looking policy/think pieces.
  - Rosemary Miller: Consider paying Executive members a stipend to fund time spent on Society work.
  - Scott Larned: invite submissions from members; survey to get decision following above discussion
  - Jon Harding: suggested making \$25,000 available to spend; also reminded members that printing fees for the book 'Advances in Freshwater Science' were still to be invoiced (likely around \$20,000). The Exec. have approval to spend money.

- Angus McIntosh: Executive has the mandate from members to spend money.
- Carolyn Burns: perhaps send a short paragraph out to members regarding likely outcomes, but agrees that the Exec. has mandate.

*Motion:* That the Society can spend up to \$20,000 this year.  
(Marc Schallenberg / Joanne Clapcott – carried)

- Revamping of NZFSS conference awards – there are a number of Society and non-Society awards
  - Dean Olsen: the current awards take a lot of time to judge.
  - Rich Allibone: sponsoring prizes is not about advertising, but rewarding good work by students
  - Richard Measures: decreasing the number of prizes may not necessarily decrease the workload as talks still need to be judged.
  - Carolyn Burns: Awards give prestige, regardless of the prize amount.
  - Angus McIntosh: agrees with Carolyn. Awards are important to students. SIL prizes are important because of the kudos of the Award.

*Motion:* A sub-committee be put together to report back to members at next AGM.

(Marc Schallenberg / Carolyn Burns – carried)

- NZFSS has an increasingly public presence, so some procedures should be developed for responding to different types of public engagement
- Procedure for submissions from the NZFSS
  - Marc Schallenberg: submissions process currently do not follow a set procedure, also timeframes can be tight, so an agreed process should be developed. Current process: email document to Exec., collate replies, circulate to Exec for comment, send draft to eminent members of Society for input and vetting, sign off by president.
  - Clive Howard-Williams: the last two submissions have been very good. Not sure how a new process would work.
  - Marc S: the current process is ad-hoc so it is better to have an agreed procedure.
  - Sophie Allen: send out approved draft to members / community
  - Kate McArthur: some sharing of drafts do occur with other societies, e.g. HydroSoc. But often time-frames are very tight so limited time to share with members
  - Marc S.: submissions are posted on the Society webpage. So the process is to circulate to the Exec. and members; draft to have input by eminent members of the Society to ensure rigor; final sign off by president
  - Clive Howard-Williams: agrees with process.
- Procedure for press releases; spontaneous media comment
  - Marc S: press releases currently written by president, with input from others.
  - Brendan Hicks: This needs to be a streamlined process; needs to be fast.
  - Clive Howard-Williams: the Society trusts the response from the Exec. There are time constraints

in responding, but seek further guidance by selected members where required/possible.

- Marc S: there are times when the press requests immediate response, so not possible to get others to consider response.
- Erron Henderson: Marc's response to media questions is excellent, especially the recent interview on Radio NZ (with Kathryn Ryan). Agrees that this process works.
- John Quinn: Agrees that Marc handles media well and makes distinction between NZFSS response and his own opinion.
- Updating the NZFSS constitution (last updated 14 years ago). A lot has changed with regard to what the Society does and how things are done.
  - Mahuru Robb: The current constitution is sufficiently broad, so no additional words required to reflect commitment to mātauranga Māori. Including a Māori name for the Society would require getting an expert in Te Reo.
  - Angus McIntosh: If the constitution was going to be modified, do we add a list of protocols and policy. For instance, a policy on people taking photos (at conferences) and sending to social media platforms. The Ecological Society has a social media policy, so could adopt this.
- Progressing NZFSS accounting and membership systems to web-based platform
  - Marc S: This was approved at last year's AGM. It will go on the annual plan this year. Jay Piggott has suggested that this may cost between \$30,000 - \$40,000.
- ANNUAL PLAN (2017)
  - Establish a constitutional reform subcommittee to organise amendments / changes to our constitution
  - Adopt public engagement procedures
  - Migrate accounting and membership functions to web-based platform
  - Develop a conference awards policy.

*Motion:* That the Society adopt the annual plan.

*(Marc Schallenberg / full agreement from members – carried)*

- FIVE-YEAR PLAN (2017-2022)
  - Update the constitution to reflect NZFSS evolution
  - Develop and run an international workshop
  - Produce a series of forward-looking policy/think pieces
  - Engage creatively with SIL and ASLO conferences if possible.

## 9. General Business

- David Hamilton: The Society should consider developing an award for mid-career scientists, as there currently is none. The Award could fund a member to attend SIL conferences (there is a poor turn out from NZ relative to other countries). The SIL 2018 will be in China, SIL 2020 will be in Germany and SIL 2022 will be in South Korea. He also reminded members that Jay Piggott received a SIL award which is significant, with Jay giving a plenary at SIL 2016.

- David Hamilton: Early newsletters have been scanned and are ready for uploading onto the website, once web developments can support this.
- Brendan Hicks: Advised that the Australian Society for Fish Biology were having their conference in Albany, West Australia on July 21-24th 2017. Advised that for more information on membership to the Society could be found at [www.asfb.com.au](http://www.asfb.com.au).
- Marc Schallenberg: Reminded members that job vacancies are now advertised through the NZFSS forum. A plan is to put a link from the website to the job vacancies thread.
- Carolyn Burns: consider using RSNZ to post vacancies.
- Scott Larned: make vacancies more visible, to make it easier for employers.
- Angus McIntosh: Next year will be the 50th AGM, so it is an important year.
- Natasha Petrove: confirmed that the Society was founded in 1968.
- Kate McArthur: Some of annual spending could be used to budget celebrations, invite guests to conference.

## 10. Future Conferences

- 2017: Hamilton: Kevin Collier and Natasha Grainger are co-chairing. This will be a joint conference with other international groups.
- 2018: A brief discussion about possible sites in the South Island. Natasha Petrove and Carolyn Burns confirmed that the Society was founded in Christchurch, so this is a possible venue.

## 11. NZFSS Medal 2017

Awarded to John Hayes (not present at the AGM). Marc advised that the medal would be presented at the next AGM (in Hamilton 2017).

The meeting closed at 7:15 pm. ■

# 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 31<sup>st</sup> 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 30<sup>th</sup> of June shall be unfinancial and shall be liable to forfeit all benefits of membership. The financial year shall conclude on the 30<sup>th</sup> 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, landuse 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:

Amy Whitehead, NZFSS Secretary-Treasurer, c/- NIWA, PO Box 8602, Riccarton, Christchurch 8440

or email to: amy.whitehead@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.....

The default format for sending the NZFSS newsletters is a PDF via email. Opt in here if you need a hardcopy posted to you:

☐ Please send me a hardcopy 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 Direct Credit** (preferred method) – Acct: BNZ 02-0700-0354213-00 (include your name in the Reference/Details field)  
Date paid.....

☐ **Payment by Credit Card** (please tick one) ☐ Visa ☐ Mastercard  
Name on Card..... Card Number.....  
Card Expiry Date..... Signature of Cardholder.....

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

**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](http://www.freshwater.science.org.nz) for more details.









No fish or invertebrates to be found in this tropical rainforest streams in Colo-I-Suva National Park in Fiji. See article on page 36.

Photo © Kati Doehring





NEW ZEALAND  
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