Otago Regional Council SOE Monitoring 2010: Aquatic Invertebrate Summary

EOS Ecology Report No. 09024-ORC01-03 | June 2010

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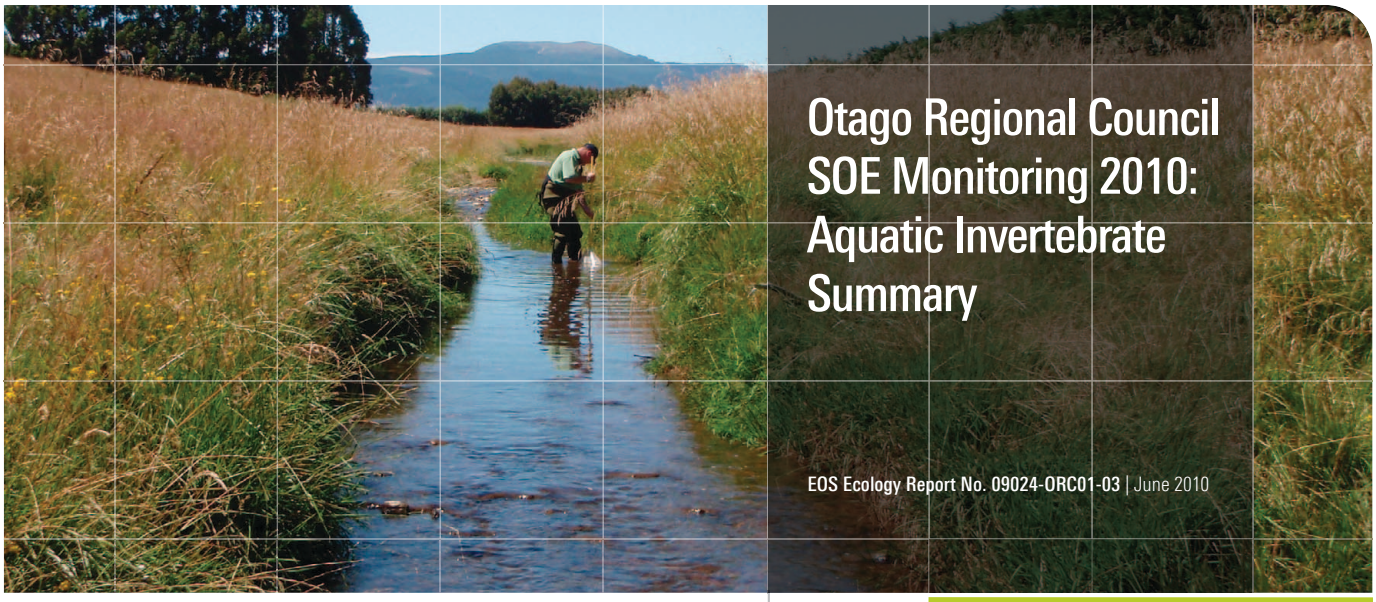

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REPORT

Prepared for
Otago Regional Council

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1 INTRODUCTION

Between the 3rd and 10th of February 2010, EOS Ecology conducted the field component of Otago Regional Council's (ORC) 2010 State of the Environment (SOE) monitoring at 30 sites throughout the Otago region; from Oamaru west to Wanaka and south to the Catlins. This involved a habitat assessment and collection of periphyton and macroinvertebrate samples and subsequent laboratory analysis and processing. This report summarises the methodology and results of the aquatic macroinvertebrate component. EOS Ecology was not asked to analyse the results but only to present a summary of the methods used and tabulate the raw data.

2 METHODS

2.1 Fieldwork

Macroinvertebrate samples were collected using a kicknet following Protocol C1 "hard-bottomed, semi-quantitative" of Stark *et al.* (2001). Samples were preserved in the field in 70% isopropyl alcohol (IPA). To prevent the spread of the invasive diatom *Didymosphenia geminata* (which is prevalent in the Otago region) among sampling sites, all equipment that came into contact with the water and substratum was cleaned in a 5% dishwashing detergent solution following Biosecurity New Zealand protocols between sites.

2.2 Processing

Samples were processed following the Protocol P1 "coded-abundance" procedure of Stark *et al.* (2001). Each taxon is assigned a coded abundance category based on an estimate of their numbers in the sample (Table 1). Invertebrates were identified to the level recommended in Stark *et al.* (2001) and where necessary, taxonomic keys were used (e.g., Winterbourn *et al.* 2006).

2.3 Analysis

Several invertebrate metrics commonly used to assess water and habitat quality were calculated:

- Number of taxa: Taxa richness is the number of different taxa identified in each sample. Taxa is generally a term for taxonomic groups, and in this case refers to the lowest level of classification that was obtained during the study. Taxa richness can be used as an indication of stream health or habitat type, where sites with greater taxa richness are usually healthier and/or have a more diverse habitat.
- EPT richness: The majority of EPT species (Ephemeroptera, Plecoptera, and Trichoptera) are sensitive to water quality and habitat degradation and in general the more of these taxa present the higher the water and habitat quality. Hydroptilid trichoptera (i.e., *Oxyethira, Paroxyethira*), however, are often abundant in degraded waterways where they thrive in high-algae conditions, thus EPT richness has been presented with and without these taxa included.

TABLE 1 Abundance classes for processing semi-quantitative macroinvertebrates (adapted from Stark 1998).

Abundance class		Counts	Coded abundance
R	Rare	1–4	1
C	Common	5–19	5
A	Abundant	20–99	20
VA	Very abundant	100–499	100
VVA	Very very abundant	500+	500

- Macroinvertebrate Community Index (MCI): In the mid-1980s the macroinvertebrate community index (MCI) was developed as an index of community integrity for use in stony riffles in New Zealand streams and rivers, and can be used to determine the level of organic enrichment for these types of streams (Stark, 1985). Although developed to assess nutrient enrichment, the MCI will respond to any disturbance that alters macroinvertebrate community composition (Boothroyd & Stark, 2000) and as such is used widely to evaluate the general health of waterways in New Zealand. Caution should be applied however, when using this score in soft-bottomed, slow flowing streams. MCI scores of ≥120 are interpreted as "excellent", 100–119 as "good", 80–99 as "fair", and < 80 as "poor".
- Semi-Quantitative Macroinvertebrate Community Index (SQMCI) (Stark, 1998): The SQMCI is similar to the MCI but taxa scores are weighted based on coded abundance, meaning that taxon abundance is taken into account. As with the MCI the same caution with use of the SQMCI in soft-bottomed streams applies. SQMCI scores of ≥ 6.00 are interpreted as "excellent", 5.00-5.99 as "good", 4.00–4.99 as "fair", and < 4.00 as "poor".

2.4 Quality control

Internal quality control procedures were employed throughout sample processing including identification checks by a senior aquatic macroinvertebrate processor and senior scientists. Three of the macroinvertebrate samples (10%) underwent Protocol QC1 "quality control for coded-abundance" as detailed in Stark *et al.* (2001). Quality control was performed externally by Stark Environmental Ltd.

3 RESULTS

All sites (Table 2) were surveyed between February 3rd and 10th, 2010. The only difficulties encountered during macroinvertebrate sampling were:

- Site 9—Waikouaiti River @ Orbells Crossing is a tidally influenced site and the stage of the tide influences a number of key hydrological parameters such as depth, width, and velocity. This may also influence the invertebrate community present, thus the derived metrics should be interpreted with caution.
- Site 14—Waipori River @ Falls Reserve had very variable flow due to a hydro dam upstream. We were informed by a TrustPower employee that the water level in this river changes rapidly without warning (depending on power demand). There was too much flow to safely enter the water thus the macroinvertebrate sample was taken from the edges. Given the variability in flow, the amount of time the sampled area remains inundated is unknown thus invertebrate data from this site should be treated with caution.
- Site 16—Ida Burn @ SH85 had incorrect GPS coordinates provided by ORC. The provided coordinates were for a site on Hills Creek which is northwest of Ida Burn on SH85. EOS Ecology sampled both sites (the site co-ordinates on Hills Creek as well as Ida Burn @ SH85) to ensure the correct site was sampled and subsequent correspondence with the ORC concluded that the co-ordinates were wrong. Thus the Hills Creek data has not been presented.

Site 2—Kakanui River @ McCones and Site 30—Catlins River @ Houipapa had the greatest number of taxa (26) while Site 14—Waipori River @ Falls Reserve had the least (4); although the latter was probably related to the fact we were restricted to sampling the edges there because of hydro dam water release. Site 8—Waireka Ck @ Taipo Rd had the next lowest number of taxa (10) and also had the lowest MCI score observed (60). In contrast the highest MCI score was at Site 15—Dunstan Ck @ Beattie Rd (122.4).

This site also had the highest SQMCI score (7.4). The lowest SQMCI score was at Site 21—Mill Creek @ Fish Trap (1.7). Full macroinvertebrate coded abundance and calculated site metrics are shown in the Appendices (Section 6.1).

External quality control by Stark Environmental Ltd. of three samples (Site 16—Ida Burn @ SH85, Site 20—Luggate Ck @ SH6 Bridge, and Site 28—Waipahi River @ Cairns) showed EOS Ecology's standard of identification to be excellent as no misidentified taxa were encountered. Samples from Site 20—Luggate Ck @ SH6 Bridge and Site 28—Waipahi River @ Cairns passed all quality control components (Taxonomic accuracy, Abundance coding 1–missed taxa, and Abundance coding 2–accuracy). Site 16—Ida Burn @ SH85 passed two quality control components (Taxonomic accuracy and Abundance coding 1–missed taxa) however failed on the Abundance coding 2–accuracy component. This was because the abundance codes of Acarina, *Deleatidium*, and *Olinga* differed by greater than one category between the original and quality control data sets (equal to 15.8 % of the total number of taxa thus greater than the 10% pass/fail threshold). Due to this 'fail' result we performed a full count processing procedure of this sample and found that the abundance codes of *Deleatidium* and *Olinga* did not in fact differ by greater than one abundance code. Full count processing showed *Deleatidium* was abundant (A) as was found in our original data set, while *Olinga* was common (C) compared to being abundant (A) in the original data set (a difference of only one abundance category). Acarina was also not considered a fail as this was actually a missed taxa (not present in original data) that passed the Abundance coding 1-missed taxa component (as it was not in the abundant, very abundant, or very very abundant categories). It was thus never originally assigned an abundance coding so cannot logically be included in the Abundance coding 2-accuracy component of quality control. Taking this into account we did not fail the quality control process on this sample. Our full count processing highlights the difficulty in performing adequate quality control on inherently variable rapid processing techniques such as the Protocol P1 "coded-abundance" procedure. As we subsequently passed all quality control components (or have shown the quality control results to be imperfect) we have not altered our original data set.

TABLE 2 The 30 Otago Regional Council State of the Environment biomonitoring sites surveyed between February 3rd and 10th, 2010. Note that the site codes where assigned by EOS Ecology.

Site code	Site name	Site code	Site name
1	Kakanui River @ Clifton Falls	16	Ida Burn @ SH85
2	Kakanui River @ McCones	17	Fraser River @ Marshall Rd
3	Kauru @ Ewings	18	Cardrona River @ Mt Barker
4	Shag River @ Craig Rd	19	Lindis River @ Ardgour Rd
5	Shag River @ Goodwood Pump	20	Luggate Ck @ SH6 bridge
6	Trotters Ck @ Mathesons	21	Mill Ck @ Fish Trap
7	Waianakarua @ Browns Pump	22	Heriot Burn @ Park Hill Rd
8	Waiareka Ck @ Taipo Rd	23	Waipahi River @ Waipahi
9	Waikouaiti River @ Orbells Crossing	24	Waitahuna @ Tweeds Bridge
10	Kaikorai Stm @ Brighton Rd	25	Waiwera River 1km US of Clutha
11	Lindsay Ck @ North Bar Rd	26	Crookston Burn @ Kelso-Tapanui Rd
12	Water of Leith @ Dundas Street	27	Waikoikoi Ck @ Bailey Bridge
13	Silver Stm @ Riccarton Rd	28	Waipahi River @ Cairns
14	Waipori River @ Falls Reserve	29	Tokomairiro @ West Branch Bridge
15	Dunstan Ck @ Beattie Rd	30	Catlins River @ Houipapa

4 REFERENCES

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5 ACKNOWLEDGEMENTS

We thank Stark Environmental Ltd. for the external quality control of three invertebrate samples.

6 APPENDICES

6.1 Macroinvertebrate coded abundance data

TABLE 6.1 Macroinvertebrate coded abundance results from samples collected from 30 sites in the Otago region as part of Otago Regional Council's 2010 State of the Environment monitoring. Samples were collected between February 3rd and 10th, 2010.

EOS ID		I100001	I100002	I100003	I100004	I100005	I100006
Site number		1	2	3	4	5	6
Site name		Kakanui River @ Clifton Falls	Kakanui River @ McCones	Kauru @ Ewings	Shag River @ Craig Rd	Shag River @ Goodwood Pump	Trotters Ck @ Mathesons
Order	Taxa						
ACARINA	Acarina		A	R			C
COLLEMBOLA	Collembola						
COLOEPTERA	*Berosus*	A					
	Elmidae	VA	VA	A	VA	VVA	R
	Hydraenidae						
CRUSTACEA	Isopoda - *Austridotea*						
	Cladocera	A					
	Ostracoda	A	A		VA	A	VA
	Paracalliope		C			VVA	
	Paraleptamphopus						
	Paranephrops						
DIPTERA	*Aphrophila*			R		R	
	Austrosimulium						
	Ceratopogoninae						
	Chironominae	R					A
	Chironomus	C					
	Empididae	R	C				
	Ephydridae					C	
	Eriopterini			R			R
	Maoridiamesa						
	Mischoderus						
	Muscidae		A	R	A	R	
	Orthocladiinae	R	VA	A	C	A	A
	Tabanidae						
	Tanypodinae	A	A	A	R		C
	Tanytarsini		VA	A	R		C
EPHEMEROPTERA	*Austroclima*	A					
	Coloburiscus						
	Deleatidium	C	A	VA	VA	VVA	
	Zephlebia						
HEMIPTERA	*Sigara*				R	R	A
HIRUDINEA	Hirudinea						

	EOS ID	I100001	I100002	I100003	I100004	I100005	I100006
	Site number	1	2	3	4	5	6
	Site name	Kakanui River @ Clifton Falls	Kakanui River @ McCones	Kauru @ Ewings	Shag River @ Craig Rd	Shag River @ Goodwood Pump	Trotters Ck @ Mathesons
Order	Taxa						
MEGALOPTERA	*Archichauliodes*	R	R	A		R	
MOLLUSCA	*Gyraulus*		A		C	A	
	Physa		VA		A	A	
	Potamopyrgus	VVA	VA	VA	VA	VA	VVA
	Sphaeriidae						
NEMATODA	Nematoda		R				A
NEMERTEA	Nemertea						
ODONATA	*Xanthocnemis*						A
OLIGOCHAETA	Oligochaeta	A	VA	A	R	R	VA
PLATYHELMINTHES	Platyhelminthes						
PLECOPTERA	*Austroperla*						
	Megaleptoperla						
	Stenoperla						
	Taraperla						
	Zelandobius						
	Zelandoperla						
TRICHOPTERA	*Aoteapsyche*	C	A		VA	VA	
	Beraeoptera						
	Costachorema						
	Helicopsyche						
	Hudsonema	A	A	R	A	VA	
	Hydrobiosidae						
	Hydrobiosis	R	R		C		
	Neurochorema	R	R				
	Oecetis						C
	Olinga	C		VA	R		
	Oxyethira	A	VA			R	A
	Paroxyethira		R				R
	Plectrocnemia	R					
	Polyplectropus		A				
	Psilochorema	C	A	A	A	A	
	Pycnocentria	A	VVA		VA	VVA	R
	Pycnocentrodes	C	VVA	A	VA	VVA	
METRICS	Number of Taxa	24	26	16	19	20	17
	EPT richness (incl. Hydroptilids)	12	11	5	8	7	4
	EPT richness (excl. Hydroptilids)	11	9	5	8	6	2
	MCI	100.8	90.0	107.5	94.7	91.0	82.4
	SQMCI	4.5	4.8	6.2	5.2	6.0	3.4

EOS ID		I100007	I100008	I100009	I100010	I100011	I100012
Site number		7	8	9	10	11	12
Site name		Waianakarua @ Browns Pump	Waiareka Ck @ Taipo Rd	Waikouaiti River @ Orbells Crossing	Kaikorai Stm @ Brighton Rd	Lindsay Ck @ North Bar Rd	Water of Leith @ Dundas Street
Order	Taxa						
ACARINA	Acarina	C	C		C	A	C
COLLEMBOLA	Collembola					R	
COLOEPTERA	*Berosus*			R			
	Elmidae	VA		VA		R	
	Hydraenidae						
CRUSTACEA	Isopoda - *Austridotea*			A			R
	Cladocera			R			
	Ostracoda	R	VA	VA		VVA	VA
	Paracalliope		VVA	R			
	Paraleptamphopus						
	Paranephrops						
DIPTERA	*Aphrophila*	R		R	R	R	
	Austrosimulium						
	Ceratopogoninae						
	Chironominae		R		C		
	Chironomus						
	Empididae	R			A	A	A
	Ephydridae						
	Eriopterini	R					
	Maoridiamesa					R	A
	Mischoderus					R	
	Muscidae	R		R	R	R	R
	Orthocladiinae	VA	C	A	A	VVA	A
	Tabanidae	C					
	Tanypodinae	A		A	C	C	R
	Tanytarsini	C					
EPHEMEROPTERA	*Austroclima*						
	Coloburiscus						
	Deleatidium	VA				R	
	Zephlebia						
HEMIPTERA	*Sigara*						
HIRUDINEA	Hirudinea		C				
MEGALOPTERA	*Archichauliodes*	R					C
MOLLUSCA	*Gyraulus*		A	R			
	Physa			C	C	R	
	Potamopyrgus	VA	VVA	VA	A	VVA	VVA
	Sphaeriidae						

EOS ID		I100007	I100008	I100009	I100010	I100011	I100012
Site number		7	8	9	10	11	12
Site name		Waianakarua @ Browns Pump	Waiareka Ck @ Taipo Rd	Waikouaiti River @ Orbells Crossing	Kaikorai Stm @ Brighton Rd	Lindsay Ck @ North Bar Rd	Water of Leith @ Dundas Street
Order	Taxa						
NEMATODA	Nematoda			R		A	
NEMERTEA	Nemertea						
ODONATA	*Xanthocnemis*						
OLIGOCHAETA	Oligochaeta		R		A	VA	
PLATYHELMINTHES	Platyhelminthes						
PLECOPTERA	*Austroperla*						
	Megaleptoperla					C	R
	Stenoperla	R					
	Taraperla						
	Zelandobius						
	Zelandoperla						
TRICHOPTERA	*Aoteapsyche*	VA		R			
	Beraeoptera						
	Costachorema						
	Helicopsyche						
	Hudsonema			A		R	
	Hydrobiosidae						
	Hydrobiosis	C				A	C
	Neurochorema						
	Oecetis						
	Olinga	VA					A
	Oxyethira	C	R	A	VA	VA	A
	Paroxyethira						
	Plectrocnemia						
	Polyplectropus						
	Psilochorema	C		R		A	A
	Pycnocentria			R			
	Pycnocentrodes	VVA					R
METRICS	Number of Taxa	21	10	19	11	21	16
	EPT richness (including Hydroptilids)	8	1	5	1	6	6
	EPT richness (excluding Hydroptilids)	7	0	4	0	5	5
	MCI	103.8	60.0	88.4	63.6	89.5	97.5
	SQMCI	5.2	4.3	4.2	2.4	3.0	4.0

	EOS ID	I100013	I100014	I100015	I100016	I100017	I100019
	Site number	13	14	15	16	17	18
	Site name	Silver Stm @ Riccarton Rd	Waipori River @ Falls Reserve*	Dunstan Ck @ Beattie Rd	Ida Burn @ SH85	Fraser River @ Marshall Rd	Cardrona River @ Mt Barker
Order	Taxa						
ACARINA	Acarina	VA				C	C
COLLEMBOLA	Collembola						
COLOEPTERA	*Berosus*	R					R
	Elmidae	VVA	C	VA	VA	VA	VVA
	Hydraenidae	R					
CRUSTACEA	Isopoda - *Austridotea*						
	Cladocera						
	Ostracoda	VVA			R	C	R
	Paracalliope	R					
	Paraleptamphopus						
	Paranephrops						
DIPTERA	*Aphrophila*						
	Austrosimulium				R		
	Ceratopogoninae				C	C	C
	Chironominae						
	Chironomus						
	Empididae					R	
	Ephydridae						
	Eriopterini			A		R	A
	Maoridiamesa						R
	Mischoderus						
	Muscidae	R				R	
	Orthocladiinae	VVA		A	A	A	A
	Tabanidae				A		
	Tanypodinae	A		R	C		
	Tanytarsini			A		C	VA
EPHEMEROPTERA	*Austroclima*					R	
	Coloburiscus						
	Deleatidium	C		VVA	A	A	VA
	Zephlebia						
HEMIPTERA	*Sigara*						
HIRUDINEA	Hirudinea						
MEGALOPTERA	*Archichauliodes*	C		C	C		R
MOLLUSCA	*Gyraulus*						C
	Physa	A					
	Potamopyrgus	VVA	VVA	R		VA	
	Sphaeriidae						

*NOTE: Not wadeable thus sample taken from edges.

	EOS ID	I100013	I100014	I100015	I100016	I100017	I100019
	Site number	13	14	15	16	17	18
	Site name	Silver Stm @ Riccarton Rd	Waipori River @ Falls Reserve*	Dunstan Ck @ Beattie Rd	Ida Burn @ SH85	Fraser River @ Marshall Rd	Cardrona River @ Mt Barker
Order	Taxa						
NEMATODA	Nematoda						
NEMERTEA	Nemertea						
ODONATA	*Xanthocnemis*						
OLIGOCHAETA	Oligochaeta	R			R	VA	R
PLATYHELMINTHES	Platyhelminthes						
PLECOPTERA	*Austroperla*						
	Megaleptoperla						
	Stenoperla			C	C		
	Taraperla						
	Zelandobius			A			A
	Zelandoperla	R					
TRICHOPTERA	*Aoteapsyche*		R	A	A	A	VA
	Beraeoptera						
	Costachorema			C			
	Helicopsyche						
	Hudsonema				C	R	
	Hydrobiosidae						C
	Hydrobiosis	C		C	A	C	R
	Neurochorema						
	Oecetis						
	Olinga	A		VA	A		C
	Oxyethira	VA			A		C
	Paroxyethira						
	Plectrocnemia				R		
	Polyplectropus						
	Psilochorema	A		A	A	A	C
	Pycnocentria			A		C	
	Pycnocentrodes	R	R	A	C	R	VA
METRICS	Number of Taxa	20	4	17	19	19	21
	EPT richness (including Hydroptilids)	7	2	10	10	8	9
	EPT richness (excluding Hydroptilids)	6	2	10	9	8	8
	MCI	104.0	95.0	122.4	103.2	98.9	98.7
	SQMCI	3.8	4.0	7.4	5.5	4.1	5.5

*NOTE: Not wadeable thus sample taken from edges.

	EOS ID	I100020	I100021	I100022	I100023	I100024	I100025
	Site number	19	20	21	22	23	24
	Site name	Lindis River @ Ardgour Rd	Luggate Ck @ SH6 bridge	Mill Ck @ Fish Trap	Heriot Burn @ Park Hill Rd	Waipahi River @ Waipahi	Waitahuna @ Tweeds Bridge
Order	Taxa						
ACARINA	Acarina	R			R	R	R
COLLEMBOLA	Collembola						
COLOEPTERA	*Berosus*						
	Elmidae	VA	A	A	VA	VA	VVA
	Hydraenidae						
CRUSTACEA	Isopoda - *Austridotea*						
	Cladocera						
	Ostracoda		C	C	VVA	A	A
	Paracalliope				A	VVA	
	Paraleptamphopus				R		
	Paranephrops						
DIPTERA	*Aphrophila*			R			
	Austrosimulium	C					R
	Ceratopogoninae		A				
	Chironominae						
	Chironomus						
	Empididae	C		A			
	Ephydridae						
	Eriopterini	R	R				R
	Maoridiamesa	R		A			
	Mischoderus						
	Muscidae	A		C			
	Orthocladiinae	VA	A	VA		C	C
	Tabanidae						
	Tanypodinae	A	R				
	Tanytarsini	R	C	C		R	
EPHEMEROPTERA	*Austroclima*						
	Coloburiscus						
	Deleatidium	VA	R	C	VVA	A	VVA
	Zephlebia						
HEMIPTERA	*Sigara*						
HIRUDINEA	Hirudinea						
MEGALOPTERA	*Archichauliodes*	A	C		R		C
MOLLUSCA	*Gyraulus*						
	Physa				A	VA	R
	Potamopyrgus		A	A	VA	VVA	VVA
	Sphaeriidae					A	

	EOS ID	I100020	I100021	I100022	I100023	I100024	I100025
	Site number	19	20	21	22	23	24
	Site name	Lindis River @ Ardgour Rd	Luggate Ck @ SH6 bridge	Mill Ck @ Fish Trap	Heriot Burn @ Park Hill Rd	Waipahi River @ Waipahi	Waitahuna @ Tweeds Bridge
Order	Taxa						
NEMATODA	Nematoda		A			C	R
NEMERTEA	Nemertea						
ODONATA	*Xanthocnemis*						
OLIGOCHAETA	Oligochaeta	VA	A	VVA		VA	VA
PLATYHELMINTHES	Platyhelminthes					R	R
PLECOPTERA	*Austroperla*						
	Megaleptoperla						
	Stenoperla						
	Taraperla						
	Zelandobius						
	Zelandoperla	R					
TRICHOPTERA	*Aoteapsyche*	A			A	R	A
	Beraeoptera						
	Costachorema						
	Helicopsyche					A	VVA
	Hudsonema	R		R	A	A	C
	Hydrobiosidae						
	Hydrobiosis	A		R	R		R
	Neurochorema						
	Oecetis						
	Olinga	A	R		R		
	Oxyethira	A		C			
	Paroxyethira						
	Plectrocnemia						
	Polyplectropus						
	Psilochorema	A	R	C	R	R	R
	Pycnocentria	A	A	C	A		VA
	Pycnocentrodes	R	C	R	R	VVA	VA
METRICS	Number of Taxa	22	16	17	16	18	20
	EPT richness (including Hydroptilids)	10	5	7	8	6	8
	EPT richness (excluding Hydroptilids)	9	5	6	8	6	8
	MCI	103.6	103.8	87.1	112.5	91.1	102.0
	SQMCI	4.6	3.9	1.7	5.4	4.5	6.6

	EOS ID	I100026	I100027	I100028	I100029	I100030	I100031
	Site number	25	26	27	28	29	30
	Site name	Waiwera River 1km US of Clutha	Crookston Burn @ Kelso-Tapanui Rd	Waikoikoi Ck @ Bailey Bridge	Waipahi River @ Cairns	Tokomairiro @ West Branch Bridge	Catlins River @ Houipapa
Order	Taxa						
ACARINA	Acarina			A	R		R
COLLEMBOLA	Collembola				C		
COLOEPTERA	*Berosus*						
	Elmidae		VA	VVA	C		C
	Hydraenidae					C	
CRUSTACEA	Isopoda - *Austridotea*						
	Cladocera						
	Ostracoda	R	VVA	A	A	A	A
	Paracalliope	VA	VA	VA	VA		C
	Paraleptamphopus						
	Paranephrops				R		
DIPTERA	*Aphrophila*	A		C			
	Austrosimulium						
	Ceratopogoninae					A	
	Chironominae		R				
	Chironomus			R			
	Empididae			R			
	Ephydridae			R			
	Eriopterini						
	Maoridiamesa	A		A			
	Mischoderus						
	Muscidae			C			
	Orthocladiinae	A	C	VA	C	A	VA
	Tabanidae						
	Tanypodinae			C			R
	Tanytarsini	A		A		R	C
EPHEMEROPTERA	*Austroclima*						
	Coloburiscus						R
	Deleatidium	A	VA	VVA	VVA	VVA	VA
	Zephlebia				C		
HEMIPTERA	*Sigara*	R					
HIRUDINEA	Hirudinea						
MEGALOPTERA	*Archichauliodes*	A	R			A	R
MOLLUSCA	*Gyraulus*						
	Physa	R	C	VA		C	
	Potamopyrgus	VVA	VA	VA	VVA	VVA	VA
	Sphaeriidae					A	C

EOS ID		I100026	I100027	I100028	I100029	I100030	I100031
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Order	Taxa						
NEMATODA	Nematoda					A	R
NEMERTEA	Nemertea					R	
ODONATA	*Xanthocnemis*						
OLIGOCHAETA	Oligochaeta			C	R	VVA	R
PLATYHELMINTHES	Platyhelminthes						
PLECOPTERA	*Austroperla*						R
	Megaleptoperla				A		C
	Stenoperla						
	Taraperla				R		R
	Zelandobius						
	Zelandoperla					R	C
TRICHOPTERA	*Aoteapsyche*	VA	A	VVA	A	VA	C
	Beraeoptera						R
	Costachorema	R		R			
	Helicopsyche	C		R	VA	A	A
	Hudsonema	R	C	A	A	A	
	Hydrobiosidae				R		
	Hydrobiosis	C		A	R		A
	Neurochorema	A					
	Oecetis						
	Olinga					VA	VA
	Oxyethira	A					
	Paroxyethira						
	Plectrocnemia						
	Polyplectropus						
	Psilochorema	A		C	R	C	R
	Pycnocentria	R	A	VVA		VVA	VA
	Pycnocentrodes	VVA	A	VVA	A	A	VA
METRICS	Number of Taxa	21	13	25	20	21	26
	EPT richness (including Hydroptilids)	11	5	9	11	9	14
	EPT richness (excluding Hydroptilids)	10	5	9	11	9	14
	MCI	102.9	95.4	92.8	113.6	104.8	119.2
	SQMCI	4.6	4.3	5.6	6.2	5.1	5.8

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