A Sub-Antarctic Stream Continuum?

Amy E. Trice[1], Christopher B. Anderson[1,2], Amy D. Rosemond[1], William Collier[1] & Brett Maley[1]
[1]Institute of Ecology, Georgia & [2]Omora Ethnobotanical Park, Puerto Williams, Chile

Introduction

- The River Continuum Concept's (RCC) basic premise is that energy inputs and other abiotic properties vary along a stream's length with predictable consequences for biota and ecosystem processes (Vannote et al. 1980).
- The RCC describes low order streams (1st-3rd) as shady with high inputs of terrestrial material; mid-order streams (4th-6th) are more exposed to light fueling an increase in primary production, where the scraper functional group is suggested to be dominant; and high order streams (>6 order), generally contain collectors as the primary functional group due to fine benthic organic matter as dominant food source.
- However, streams in New Zealand have been shown to differ, exhibiting no continuum at all (Winterbourn et al. 1981).
- Here we set out to study whether or not the sub-Antarctic streams of southern Chile, which is very similar to New Zealand's South Island, likewise do not follow the RCC's prediction for faunal communities.

Study Site

• The study was conducted in the Robalo Experimental Watershed of the Omora Park on Navarino Island, Cape Horn County, Chile **Figure 1.**

• Cape Horn (54-55°S) is host to the world's southernmost (sub-Antarctic) forests, which recently have been identified as one of the world's 37 most pristine ecoregions (Rozzi et al. 2004).

• The Robalo River presents a hydrologic catchment existing in high-Andean (above tree line), bog and forested habitat.

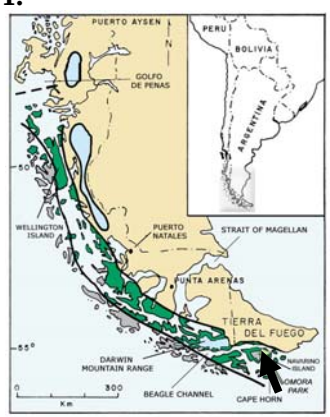

Figure 1. Map of the Magellanic Sub-Antarctic Ecoregion.

Methods

• Benthic samples were collected on the Robalo River along an altitudinal gradient, using Surber and core samplers to describe species richness, abundance, composition, and biomass **Figure 2.**

• Four sites at the following elevations: 63 m, 262 m, 470 m and 580 m.

• Five riffles were sampled at each altitude.

• Taxa identified to lowest level using Fernández & Domínguez 2001 and regional experts (see Acknowledgements).

Results

	Elevation (m)				
Total	**63 m**	**262 m**	**470 m**	**580 m**	***p***
Richness	8.9 (1.1)	9.4 (1.3)	12.4 (2.4)	8.7 (1.7)	0.4
Abundance (#/m²)	162.6 (43.3)	143.2 (43.5)	203.7 (76.2)	131.1 (45.9)	0.8
Biomass (mg/ m²)	689.4 (206.2)	261.2 (66.9)	584.3 (196.7)	176.5 (79.7)	0.06

1. Total richness, abundance and biomass was not found to vary over the longitudinal (i.e. elevation) gradient.

Table 2

				Biomass mg AFDM m⁻²			
Order	**Family**	**Genus species**	**FFG**	**63 m**	**262 m**	**470 m**	**580 m**
Amphipoda	Hyalellidae	*Hyalella simplex*	CG		114.9 (35.8)	181.9 (97.6)	34.3 (28.6)
Diptera	Blephariceridae	*Edwardsina sp.*	Sc	72.2 (72)			
	Chironomidae	Non-Tanypodinae	CG	3.6 (2.2)	12.6 (7.8)	15.4 (10.7)	8.0 (5.2)
	Simuliidae	*Gigantodax spp.*	Fil	128.4 (46.7)	49.9 (25)	144 (132.4)	3.4 (3.4)
	Tipulidae	sp. 1	CG	3.5 (1.7)	6.3 (5.7)		
		sp. 2	CG			4.1 (1.5)	
		sp. 3	CG			9.8 (9.6)	17.8 (15.9)
Ephemeroptera	Baetidae	*Andesiopsis torrens*	Sc	9.3 (0.9)	22.7 (11)		
	Leptophlebiidae	*Massartellopsis irrarazavali*	Sc	4.7 (4.4)	16.7 (9.4)		56.3 (32.5)
		Meridialaris sp.	Sc	12.9 (12.9)	10.5 (5.3)_		
Oligochaeta		aquatic worm	CG	2.8 (1.7)	19.2 (10.8)		
		earthworm	CG	8.2 (8.2)			
Plecoptera	Gripoterygidae	*Limnoperla jaffueli*	Sc	6.6 (6.6)			
		Rhithroperla rossi	Sc	11.1 (7.3)			36.2 (38)
Trichoptera	Limnephilidae	*Monocosmoecus hyadesi*	Sh	5.8 (5.8)	128.2 (127.6)		
	Hydrobiosidae	*Rheochorema magellanicum*	P		24.3 (18.3)	15.2 (13.7)	4.9 (4.9)
		Sub-total Biomass >1%		**269.1**	**382.6**	**370.4**	**160.9**
		Total Biomass		**271.6 (9.1)**	**414.5 (191.8)**	**390.2 (139.5)**	**200.4 (92.1)**
		Richness >1%		**12**	**10**	**6**	**7**

2. The order Diptera was the most diverse with five species. Ephemeroptera was second with three morpho-species. The species richness of important species (>1%) decreased with altitude (CG=collector, Sc=scraper, Sh=shredder, Fil=filterer, P=predator).

Figure 2. Sampling at 580 m.

3. Functional Feeding Group biomass did not significantly change through the length of the stream.

	Elevation (m)				
Functional Feeding Group Biomass (mg AFDM m⁻²)					
	63 m	**262 m**	**470 m**	**580 m**	**p**
Collector	513.9(208.3)	163.0(261.3)	284.8 (584.3)	82.4 (176.5)	0.11
Scraper	61.5 (21.9)	25.6 (6.8)	49.5 (16.8)	84.7 (29.1)	0.18
Shredder	14.9(8.8)	38.4 (34.6)	11.5 (7.7)	1.3 (1.2)	0.64
Filterer	96.1 (49.6)	22.4 (9.4)	222.3 (102.8)	5.9 (4.4)	0.01
Predator	13.1 (8.8)	15.9 (5.9)	43.4 (17.4)	8.7 (4.1)	0.08

Conclusions

• The Robalo River did not follow the overall RCC predictions with respect to changes in Functional Feeding Groups throughout the length of the stream.

• Shredders, however, did not occur above 470 m due to the lack of allochthonous inputs.

• As in New Zealand, this sub-Antarctic stream has a large number of generalist species found throughout.

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