Otolith microchemistry and movement of rainbow trout and common smelt between lakes Rotoiti and Rotorua: 2005 to 2010

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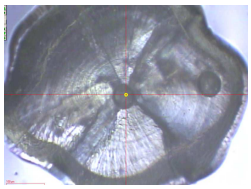

Presentation to the EBOP Rotorua Lakes Fisheries Panel Meeting,
16 August 2010, Rotorua

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Overview of methods

- Wild rainbow trout collected between 1 Oct 2005 and 17 Apr 2010
- Common smelt collected between 12 Dec 2005 and Feb 2010
  - Not all have been analysed
- Otolith chemistry measured using laser ablation inductively couple plasma mass spectrometry (LA-ICP-MS)
  - Identical methods to Matt Riceman's previous study (Riceman 2008)

Wild rainbow trout

- Lake of origin predicted using Matt Riceman's discriminant function analysis (DFA) of juvenile trout otoliths from tributary streams of lakes Rotoiti and Rotorua
  - Barium, strontium, zinc, manganese, rubidium
- Apply discriminant functions from juveniles to nucleus of angler-caught adults
- 3-year life history – slower to show effect of the wall

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Common smelt

- Lake of origin predicted using new DFA created with pooled data from 2005-2008 for edges of otoliths from smelt from beaches of lakes Rotoiti and Rotorua
  - Barium, strontium, zinc, manganese
- Apply discriminant functions from otolith edges to otolith nucleus to find lake of origin
- 1-2 year life history – should show effects of the wall faster than trout

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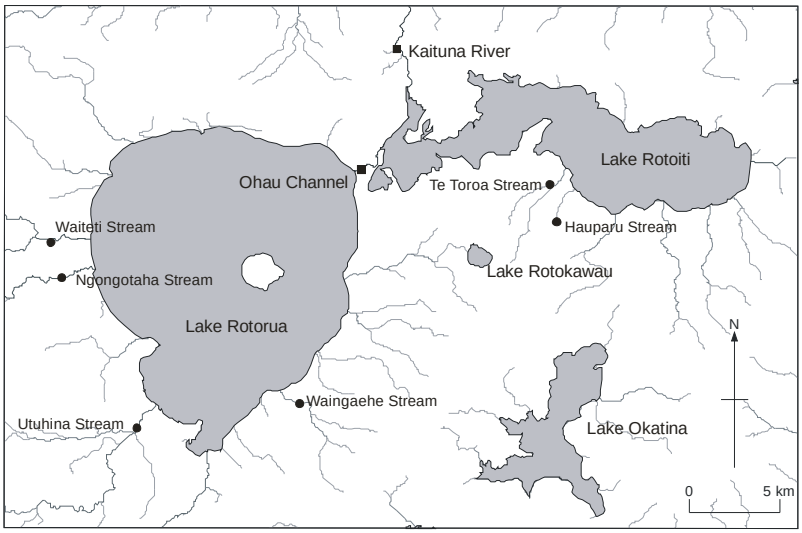
Juvenile trout tributary locations (•)



Juvenile trout classification to lake

- 21 Dec 2005 to 6 Mar 2007 (*N* = 43; Riceman 2008)

Capture	Predicted lake		
lake	Rotorua	Rotoiti	Percent correct
Rotorua	29	1	97
Rotoiti	0	13	100
Total	29	14	98

- Classification functions

Lake	Constant	sqrt Mn	sqrt Zn	sqrt Rb	sqrt Sr	sqrt Ba
Rotorua	-233.286	10.723	4.650	23.309	17.363	-15.015
Rotoiti	-201.399	8.338	5.376	18.867	16.417	-15.523

Classification of angler-caught adults

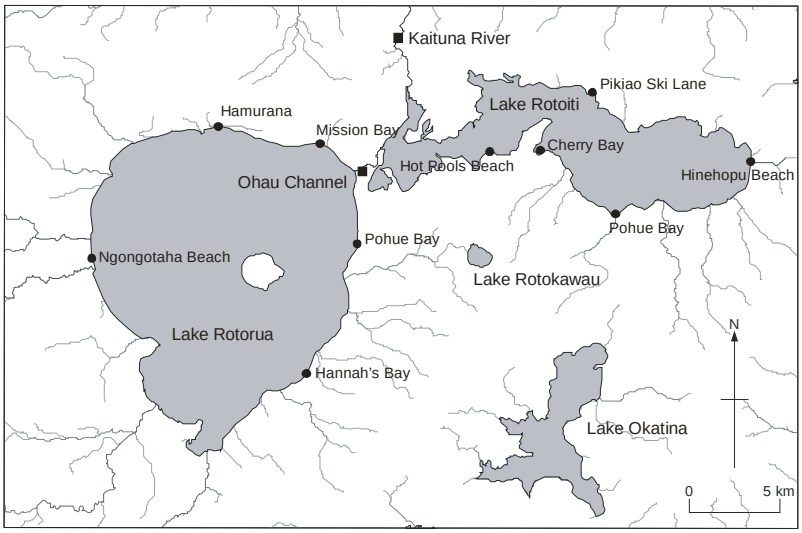
- 2005-2008 (*N* = 111)

Place of capture	Predicted lake of origin (number)			Predicted lake of origin (%)	
	Rotoiti	Rotorua	Total	Rotoiti	Rotorua
Ohau Channel	2	30	32	6	94
Rotoiti	6	41	47	13	87
Rotorua	4	28	32	13	88
Total	12	99	111	11	89

- 2009-2010 (*N* = 104)

Place of capture	Predicted lake of origin (number)			Predicted lake of origin (%)	
	Rotoiti	Rotorua	Total	Rotoiti	Rotorua
Ohau Channel	0	2	2	0	100
Rotoiti	20	37	57	35	65
Rotorua	7	38	45	16	84
Total	27	77	104	26	74

Smelt beach sample locations (•)



Smelt classification to lake from otolith edge

- 2005-2008 (*N* = 116)

Actual	Predicted group		
group	Rotoiti	Rotorua	Percent correct
Rotoiti	90	36	71
Rotorua	34	80	70
Total	124	116	71

- Classification functions

Lake	Constant	sqrt Mn	sqrt Zn	sqrt Sr	sqrt Ba
Rotoiti	-215.212	-7.241	2.455	15.417	-12.814
Rotorua	-231.567	-5.411	2.053	16.070	-13.862

Smelt classification to lake from otolith nucleus

- 2005-2007 (*N* = 122)

Capture	Predicted origin (number)			Predicted origin (%)	
location	Rotoiti	Rotorua	Total	Rotoiti	Rotorua
Rotoiti	6	52	58	10	90
Rotorua	5	59	64	8	92
Total	11	111	122		

- 2008 (*N* = 126)

Capture	Predicted origin (number)			Predicted origin (%)	
location	Rotoiti	Rotorua	Total	Rotoiti	Rotorua
Rotoiti	28	55	83	34	66
Rotorua	5	38	43	12	88
Total	33	93	126		

Conclusions

- Trout 2005-2008
  - 88% of wild adult rainbow trout in Lake Rotorua originated from Lake Rotorua
  - 13% of wild adult rainbow trout in Lake Rotoiti originated from Lake Rotoiti, 87% from Lake Rotorua
- Trout 2009-2010
  - 84% of wild adult rainbow trout in Lake Rotorua originated from Lake Rotorua
  - 35% of wild adult rainbow trout in Lake Rotoiti originated from Lake Rotoiti, 65% from Lake Rotorua
- Smelt 2005-2007
  - 92% of common smelt in Lake Rotorua originated from Lake Rotorua
  - 10% of wild adult rainbow trout in Lake Rotoiti originated from Lake Rotoiti, 90% from Lake Rotorua
- Smelt 2005-2007
  - 88% of common smelt in Lake Rotorua originated from Lake Rotorua
  - 34% of common smelt in Lake Rotoiti originated from Lake Rotoiti, 66% from Lake Rotorua
- Smelt classification is less reliable than trout
- Another two years sampling is require to prove the effect of the wall

References

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