Stream health assessments: comparing scientific and cultural indices

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Outline

- 1. Monitoring using freshwater Invertebrates
- 2. Cultural Health Indicators
- 3. Comparative study
- 4. Summary

1. Monitoring using Freshwater Invertebrates

- Aquatic insects, snails, crustacea, worms
 - Very important ecological role:
 - Food for fish, birds
 - Relatively long-lived
 - Sedentary (c/w fish)
 - Well-known environmental preferences
 - Relatively easily identified
- Ideal to monitor environmental conditions
- Act as integrators of environmental conditions at a site (c/w WQ monitoring)
- Objective and consistent measure of stream health
 - High skill level, often complex, but can be taught
 - But, is often costly

Assessing stream health

Poor ecological health: high nutrients, algal cover, water temperature, fine sediment, no riparian plants (e.g. pasture)

Good ecological health: moderate nutrients, algal cover, lower water temperature, less fine sediment, some riparian plants

Excellent ecological health: low nutrients, algal cover, cool temperature, no fine sediment, well vegetated banks (native bush)

























Ecological condition

Macroinvertebrate Community Index (MCI) score

- add up the tolerance scores of all the animals at a site

- 4 ecological quality classes:
 - Poor: MCl < 80
 - Fair: MCI 80 99
 - Good: MCI 110-119
 - Excellent: MCI > 119

2. Cultural Health Indicators

- Maori cultural methods:
 - more "subjective"
 - based on collective in-depth experience of different iwi/hapu groups
 - intergenerational experience
 - assesses both present and past conditions
 - cannot be "taught"
- Provide a more holistic assessment of stream health
 - Focusses on more than just ecology
- Tipa and Teirney (2006): first CHI based on rivers in Otago and South Canterbury

Two South Island iwi (Ngai Tahu and Ngati Kahungunu)

- CHI 3 components
 - 1. Traditional association of site to Māori
 - 2. Maintenance of mahinga kai resources
 - presence and abundance of mahinga kai
 - ability to harvest the species as in the past
 - ability to access a site
 - 3. A Cultural Stream Health Measure (CSHM)
 - made up of different indicators
 - The most objective and accurate reflection of Tangata whenua evaluations of stream health

Generic CSHM

1. Catchment land use

- 2. Riparian vegetation
- 3. Channel modifications
- 4. River flow
- 5. Water quality
- 6. Water clarity
- 7. Riverbed condition
- 8. Use of riparian margins

- Problems of generic CSHM:
 - differences in iwi traditions
 - cultural connection to waterways
 - natural environmental differences
- Generic CSHM may not be relevant for Ngāti Awa

- Tipa and Tierney (2006)
 - stream health in Tukituki catchment (Hawke's Bay)
 - used 17 indicators
 - (12 CSHM and 5 Mahinga Kai)
- selected these for this study
- Can we use the generic CSHM in the BoP? Or
- Do we develop a new indicator?

1. Catchment land use	CSHM
2. Riverbank condition	CSHM
3. Riparian vegetation	CSHM
4. Indigenous species	CSHM
5. Riverbed condition	CSHM
6. Channel modifications	CSHM
7. Use of the river (takes or discharges)	CSHM
8. River flow	CSHM
9. Water quality (pollution)	CSHM
10. Water clarity	CSHM
11. Use of riparian margin	CSHM
12. A variety of habitats	CSHM
13. Safe tasting water?	Mahinga Kai
14. Would you fish here?	Mahinga Kai
15. Safe eating fish?	Mahinga Kai
16. Safe to swim?	Mahinga Kai
17. Food sources present?	Mahinga Kai



Results

• Sampled a wide variety of waterways

Factor	Min	Max
Width	0.72	21.6
HABSCORE	145 (poor habitat)	365 (excellent habitat)
LAND_INDEX	0.28 (urban)	0.79 (native bush)
MCI	55 (poor)	137 (excellent)
EPT	0	30
CSHM	1	5



Strong relationships between CSHM and MCI

Streams with high cultural values also support good invertebrate communities

But, relatively high variability in scores The two methods have some dissimilarities



The Puarenga Stream

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No significant relationships found

- Two sites: higher MCI scores than CSHM
- Scored low culturally due to runoff from RDC wastewater
- Discharging human waste is against Maori concepts

- Two sites: lower MCI scores than expected
- Below natural geothermal inputs
- affected invertebrates and MCI scores

4. Summary

- Overall, there were generally good relationships between CSHM and MCI
- But, not within the Puarenga catchment
 - emphasises the different world-view points
 - highlights concepts of ki uta ki tai
 - dilution of contaminants is not shared by iwi

The Future, & challenges

- The Future?
 - use CSHM as additional tools to assess stream condition
 - build cultural assessments into policy/rules
 - e.g,. Cultural values (Mauri) must not be reduced
 - reliance on Whakapapa to allow historical values to be recorded
 - assess relationships b/w cultural values and flow
- Challenges:
 - Tension between holistic concepts of Mauri and need for a numerical value in plans
 - Need to protect Matauranga Maori as Taonga, but also use it for management
 - Use of "Generic" CSHM measures vs measures specific to individual iwi/hapu