

Development of a Wetland Macroinvertebrate Community Index

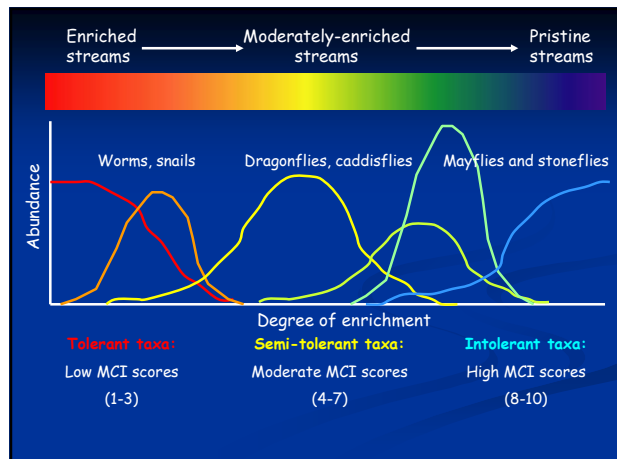
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Monitoring river health

- Freshwater invertebrates are widely used to assess river health
- Why?
 - widespread
 - easily collected and identified
 - act as long-term integrators of conditions
 - have known ecological niches.
- Macroinvertebrate Community Index (MCI)
 - way to assess biological health of rivers
 - reduces complex community data to a simple number
 - NZ's most widespread biotic index

MCI development

- Developed in Taranaki streams
- Sampled streams in 3 organic enrichment gradients
 - no enrichment
 - mild enrichment
 - moderate enrichment
- Examined how invertebrate densities differed along this gradient



- River health = $\frac{\text{sum of MCI scores}}{\text{scoring taxa}} \times 20$
- 80 = organic enrichment; > 120 = Pristine
- By looking at invertebrates
 - can assess a river's condition

Monitoring wetlands

- Wetland condition currently assessed by:
 - Wetland condition index (Clarkson et al)
 - Index of Ecological Integrity (Aussiel et al)
- Landscape based assessments
- Not focussed on aquatic components
 - arguably the first to degrade with nutrients, sedimentation or changes to hydrology
- Presently, there are no ways to assess wetland health using aquatic invertebrates
 - MCI was developed for rivers only

This study

- Aimed at producing a wetland MCI
- Needed to survey a wide range of wetlands
 - "pristine to poked"
 - 84 South Island wetlands
 - Examined how invertebrate densities differed with changes in wetland condition



6 regions
Diverse landuses
Native bush, dairying,
urban development

The good



Burmeister Lagoon, South Westland

The (not so) bad



Tokomarino River Swamp, Otago

And, the ugly



Timber Yard Point, Lake Ellesmere, Canterbury

But.... an interesting dilemma

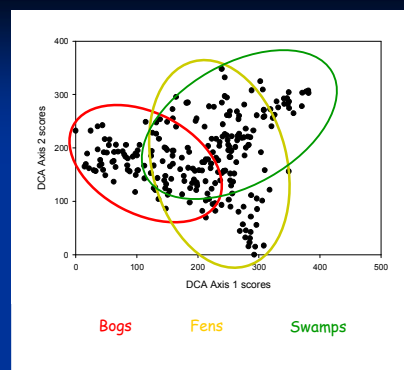
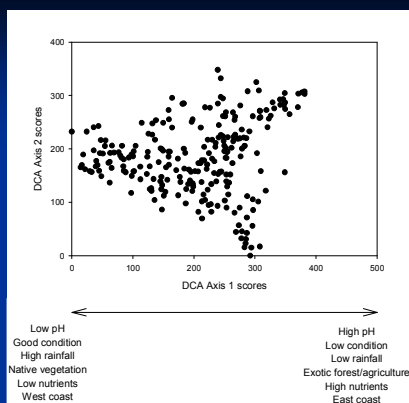
- Invertebrates controlled many factors:
 - Wetland type (differences in water chemistry: pH, nutrients)
 - landcover, climate
 - biogeography
- Are these important in developing a Wetland MCI?

Question?

- Will a combined wetland MCI suffice
Or,
- Create individual scores for bogs, fens and swamps?
- -> need to measure pH prior to scoring
 - problems with within wetland pH variability
 - confusion with multiple Wetland MCI scores
 - problem with encountering new taxa

Exploratory analysis

- 2 datasets: invertebrate data + environmental data
- Ordination:
 - Assess changes to community composition
 - examine relationships between communities and environmental variables



Ordination results

- Bogs, fens and swamps do support different taxa, BUT
- *No clearly defined groupings, but strong gradients*
- Invertebrates controlled by many factors, including pH and wetland condition, climate, land cover etc
- Thus, developed a single wetland MCI for all wetlands

Developing the Wetland MCI

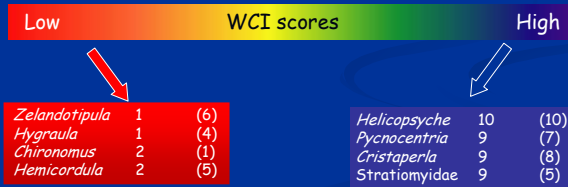
- River MCI: used organic enrichment to rank rivers
- Wetland MCI: used the WCI to rank wetlands from good to bad



- Assessed changes to abundance of each taxa along this gradient
- Developed tolerance scores (1-10) for each taxa

- 141 taxa: 21 with no river MCI scores
- Wide range of tolerance scores (1-10)
- Some similar to river MCI scores, others not

Poor condition → Moderate condition → Good condition

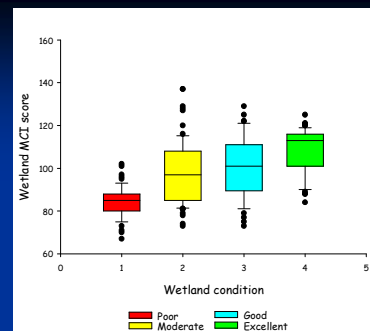


Wetland MCI performance

- Wetland MCI developed by ranking wetlands according to WCI
- Can it discriminate wetlands of different condition??
- Ideally have an independent data set
- But, tested by ranking wetlands to their IEI
 - Independent measure of wetland condition

Wetland MCI performance

- Divided wetlands into 4 percentile groups of IEI:
 - < 25% (poor condition)
 - 25 - 50% (moderate condition)
 - 50 - 75% (good condition)
 - >75% (excellent condition)
- Plotted Wetland MCI against wetland condition



- Differences b/w wetland MCI scores and condition
- Wetland MCI scores do mirror condition (as per river MCI scores)

The Wetland MCI

- uses invertebrates as indicators of wetland health
- is a scientifically defensible way to measure, compare and report wetland condition
- adds to our ability to monitor wetland condition

Future directions

- Developed South Island Wetland MCI
 - written up for NZJMF + Envirolink reports
- Need to extend to North Island
 - have sampled 70 wetlands in NI
 - currently need to complete processing from 22 other wetlands (124 samples)
- Analyse for a North Island Wetland MCI, or decide to develop a single, NZ based index

Thanks to:

- Funding:
 - TFBIS fund (Project 213)
 - DoC (Project 3695; Biodiversity of Lowland Wetlands)
 - FRST (Contract C09X0508, Maintaining and Restoring Wetlands)
 - Envirolink fund (ESRC 225 and 762-WCRC67)
 - Environment Canterbury and Environment Southland - additional funding
- Land owners throughout the South Island