Anisocentropus fijianus
**(Banks, 1936)**

USP
THE UNIVERSITY OF THE
SOUTH PACIFIC

EFFECT OF CATCHMENT
FOREST COVER ON
MACROINVERTEBRATE
COMMUNITY STRUCTURE IN
STREAMS OF FIJI

Acochlidium fijiense
(Haynes & Kenchington, 1991)

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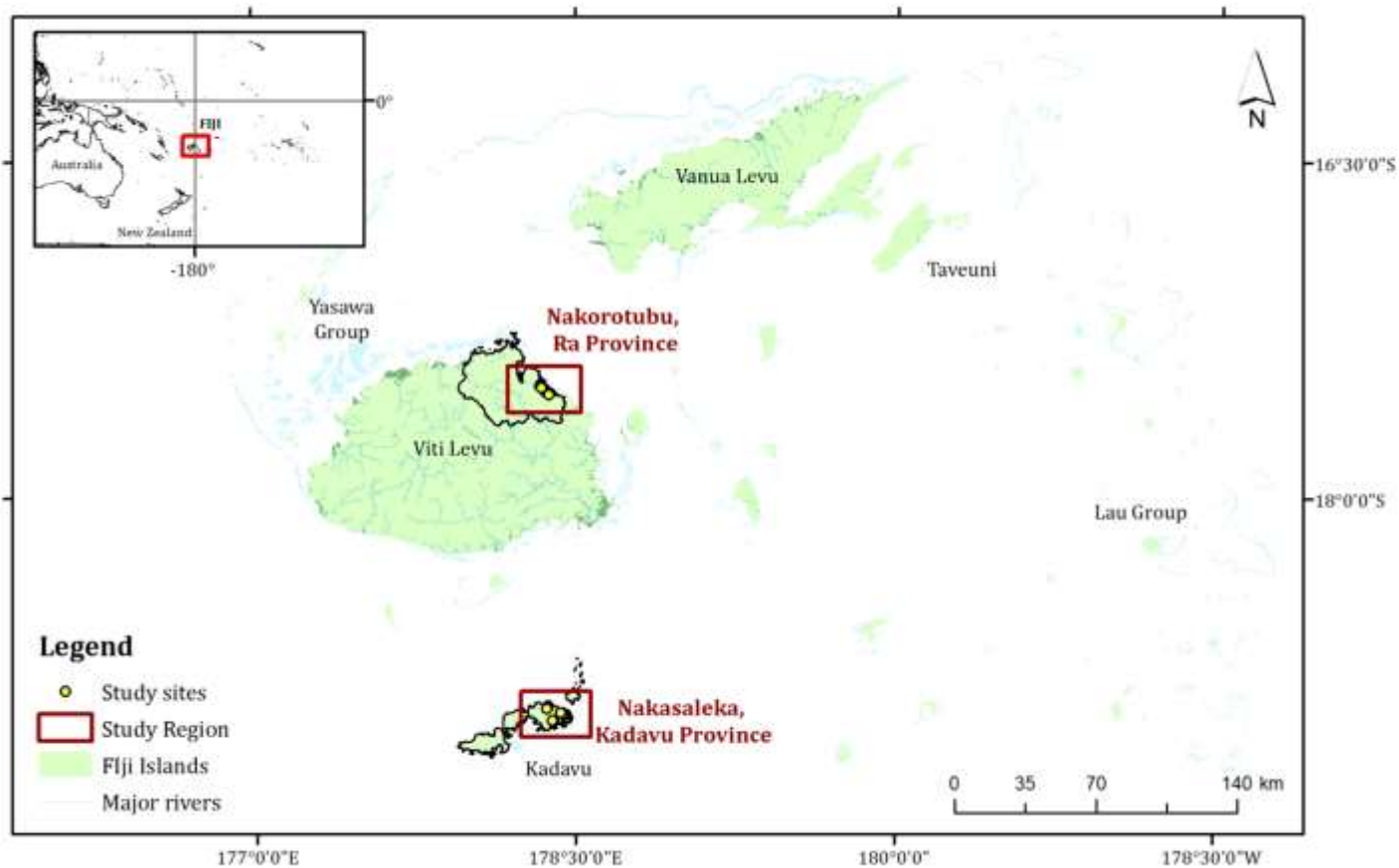Principal Supervisor: Prof. William Aalbersberg
Co-Supervisor: Dr. Gilianne Brodie

Research Aim

- Assess the ecological health of coastal rural streams in Ra and Kadavu provinces of Fiji.

Forest Cover
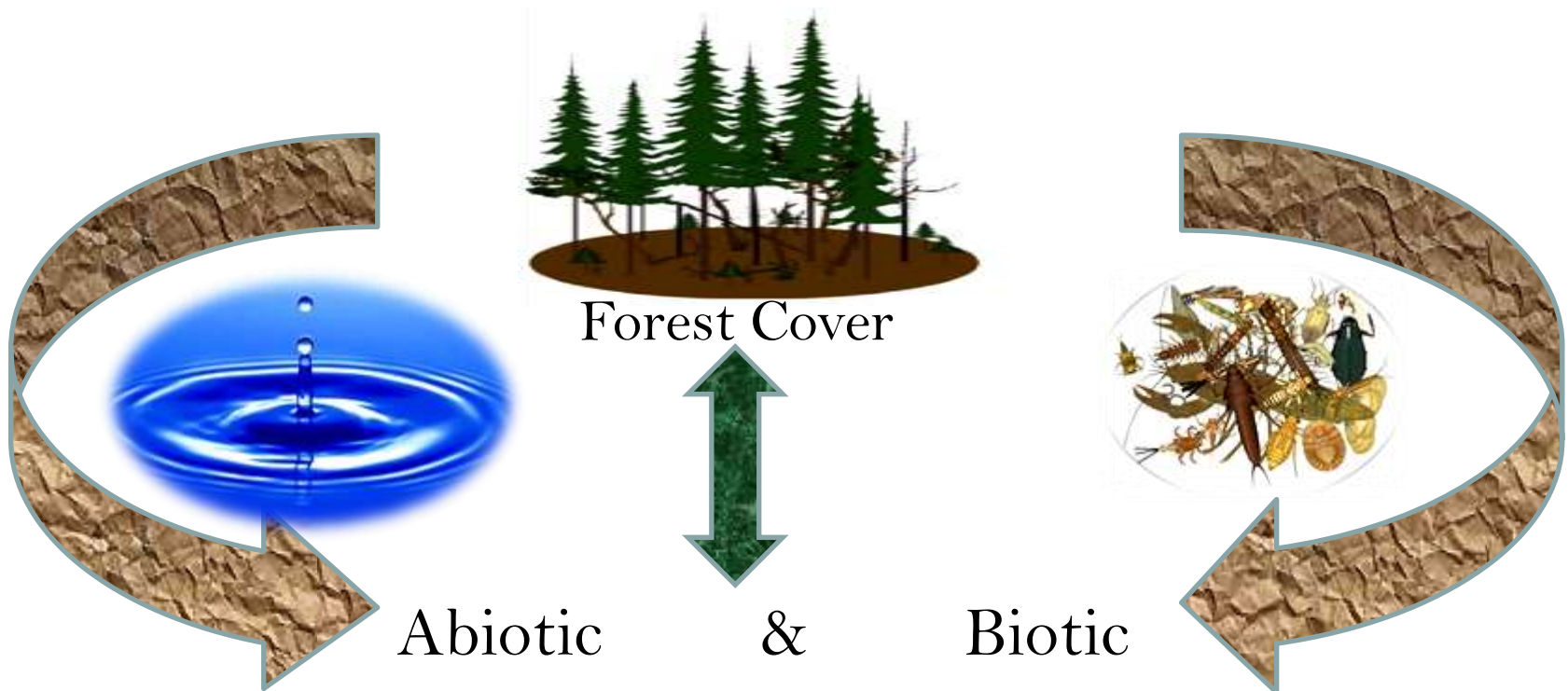
Abiotic   &   Biotic

Study Sites

Map showing the sites surveyed within Kadavu and Ra province of Fiji

Methodology
(Field Work & laboratory work)

- Biotic data collection

Surber Sampler

- Abiotic data collection
- **Chemical**
- Temperature
- Dissolved oxygen
- Conductivity
- Total dissolved solids (TDS)
- Turbidity
- pH
- Salinity
- Ammonia
- Nitrate
- Nitrite
- Total Phosphorus

Macro-habitat features
- Flow
- Riffle depth

Percentage forest cover

Data Analysis

➢ **Biotic data**

I.   Diversity measures

II. Community composition (PERMANOVA formal tests)

III. Principal Coordinate analysis (PCO)

➢ **% Forest cover** – Berkeley Image Segmentation and ArcGIS 10.x

➢ Linking abiotic variables & forest cover to macroinvertebrate communities Distance Based Linear Models (**DistLM**) results

Major Findings
Biotic data results

Taxonomic metrics

- A total of 35,334 individuals identified.

- General collection- 140 distinct taxa in 53 families


- New Records for Fiji

I.   Originally- 45 families

II.   New records include 14 families:

1.   **aquatic moth**-Crambidae--

2.   **aquatic true-flies**-Dixidae, Empididae & Stratiomyidae

3.   **Aquatic beetles**- Elmidae,Gyrinidae,Helminthidae,

Hydraenidae,Hydrophilidae, Psephenidae & Spercheidae

1.   **Water Bugs**- Mesoveliidae, Veliidae and Saldidae

# Principal Coordinate Analysis (PCO)- Kadavu & Ra

Resemblance: Modified Gower

Stream
- ▲ Korolevu
- ▼ Naqewa
- ■ Savumiri
- ◆ Naikawaqa
- ● Taveu
- + Vucinivola
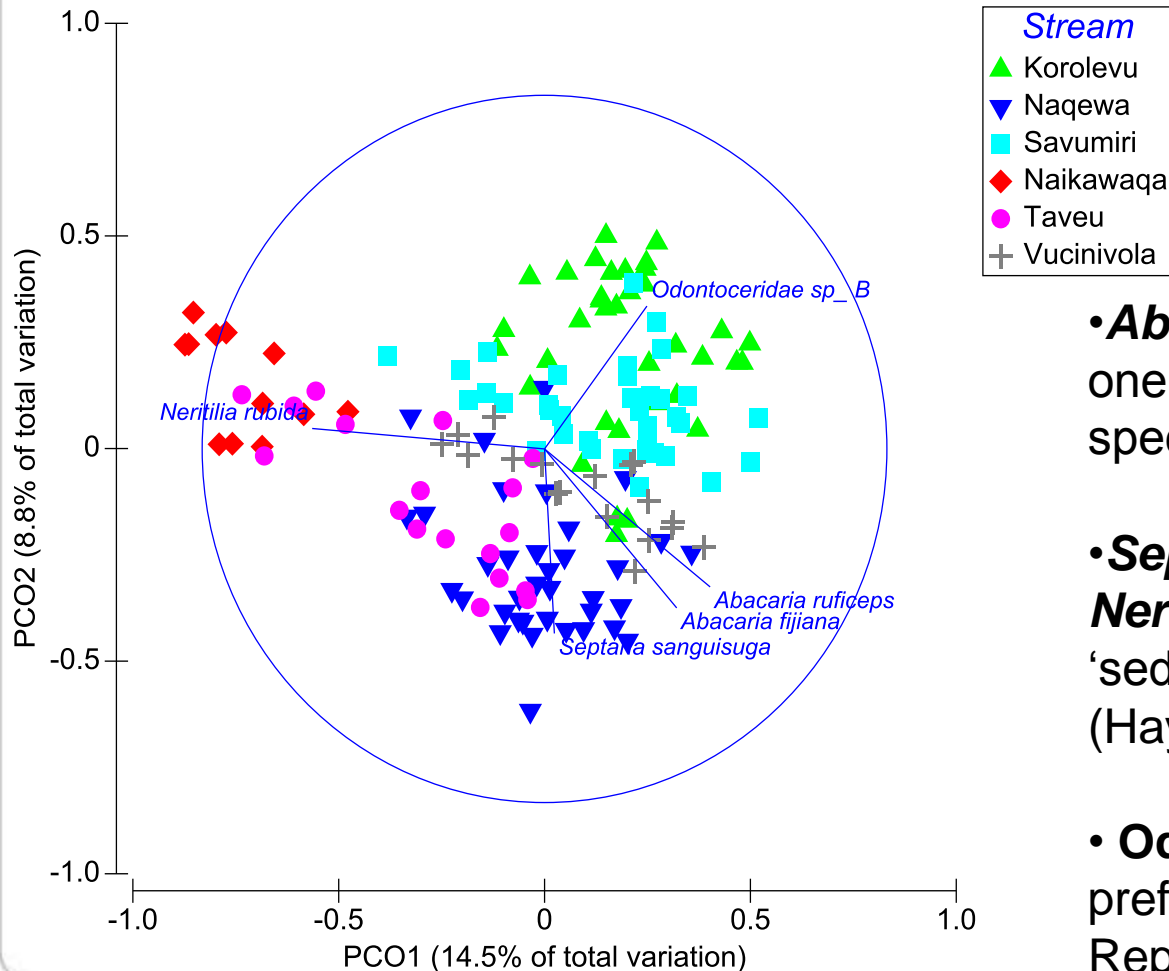
- *Abacaria fijiana-* known to be one of the 'sediment resilient species' (Haynes, 1994, 1999)

- *Septaria Sanguisuga* and *Neritilia rubida-* known to be 'sediment sensitive species" (Haynes, 1990)

- **Odontoceridae**- known to prefer clean water (IAS Reports, 2011-2013)

Percentage Forest Cover

No significant difference between the mean forestation of the two sets of catchments [T (d.f.=4)=0.588, P=0.59]
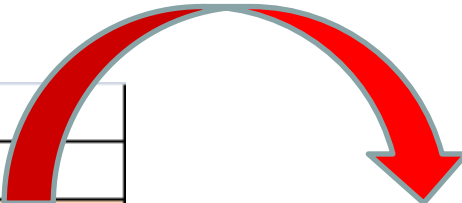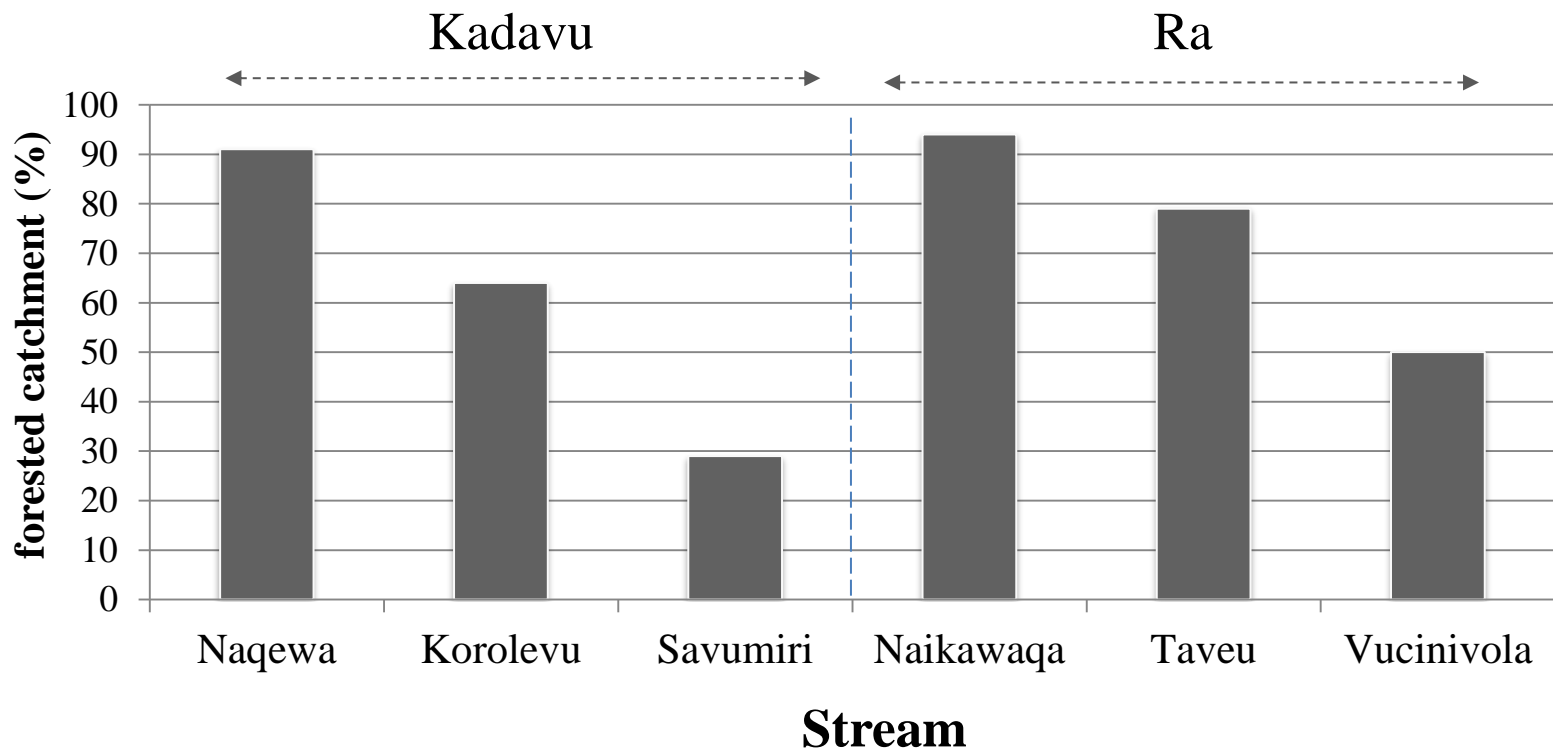
Linking abiotic variables and forest cover to biotic communities (PCO Kadavu & Ra)
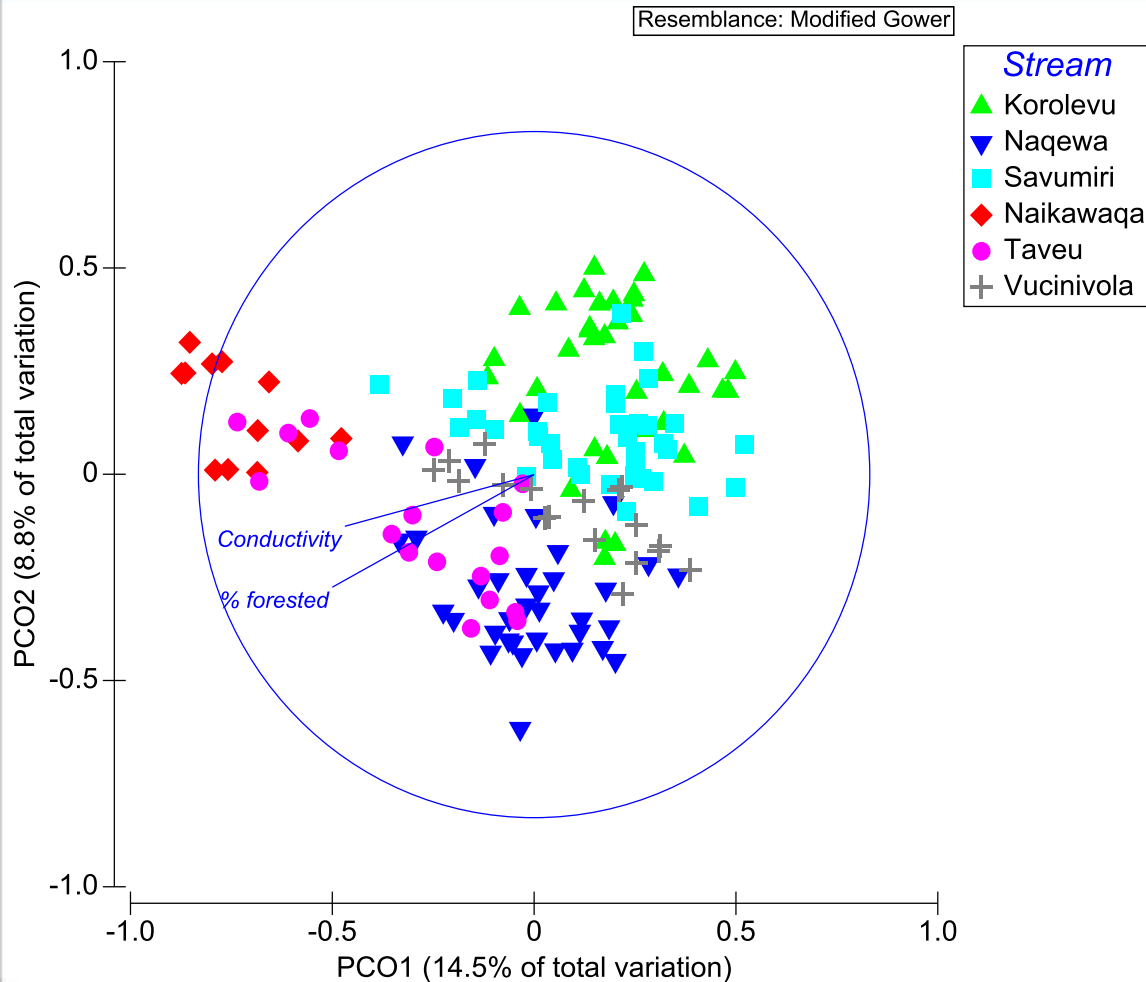
Distance based linear models (DistLM) results

DistLM results on the macroinvertebrate data examining the correlation between biotic community and the corresponding environmental variables.

MARGINAL TESTS				
Variable	SS (trace)	Pseudo-F	P	R^2
% forested	7.9889	12.702	0.0001	7.62E-02
Conductivity	7.1752	11.313	0.0001	6.84E-02
Canopy cover	5.2191	8.0677	0.0001	4.98E-02
Nitrate	5.0273	7.7562	0.0001	4.80E-02
Temperature	4.6876	7.2076	0.0001	4.47E-02
Ammonia	3.2636	4.9477	0.0001	3.11E-02
pH	3.2175	4.8757	0.0001	3.07E-02
Total Phosphorus	3.0644	4.6367	0.0001	2.92E-02
Dissolved Oxygen	2.8577	4.3152	0.0001	2.73E-02
Substrate composition	2.5959	3.9098	0.0001	2.48E-02
Faecal coliform	2.4037	3.6135	0.0002	2.29E-02

Best Solution single variable model -
% forested- highest R^2 correlation value

Best Solution with 2 Variables-
% Forested & Conductivity
(R^2 correlation value= 0.124)

Conclusions

- Multivariate analysis linking abiotic and biotic data suggests that **% forest cover** as an environmental factor explained the greatest amount of **variation** in the **macroinvertebrate community structure.**

- Several species were identified that appear to be possible indicators of health of catchments when considering forest intactness.

Species associated with Highly forested catchments

Finger-net Caddisfly
Chimarra sp.

Size: 16-17mm long

Riffle shrimp
Atyopsis spinipes

Limpet snail
Septaria
Sanguisuga

Neritid snail
Neritilia rubida

Species associated with least forested catchments

Clinging Mayfly
Pseudocloeon sp.

Net spinner caddisfly
Abacaria fijiana

Size: 16-18mm long

Size: 7-8mm long

Recommendation

- Development of an appropriate Freshwater macroinvertebrate sampling protocol for Fiji.

- Freshwater Macroinvertebrate Guide.

- Matrices for stream health assessment.

Acknowledgements

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External collaborators:

- Mr. Nick Carter (Freshwater Ecologist-Golder Associates NZ)
- Dr. Satish Choy (Aquatic Ecologist-Queensland Dept. of Environment & Resource)
- Prof. Peter Ng Kee Lin (Crustacean Taxonomist & Freshwater Ecologist-Dept. of Biological Sciences, National University of Singapore)

Thank You