

# Coral Reef Fish Biodiversity & Ecosystem management in the South Pacific

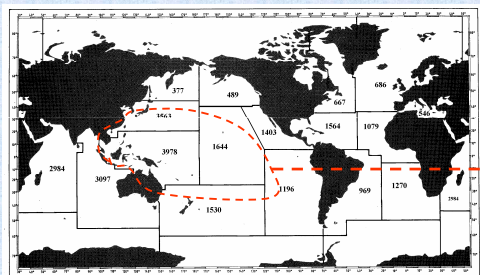
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Coral Reefs are a major source of fish in the Indo-Pacific

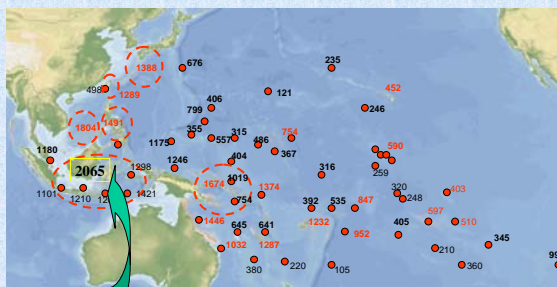
There is a lack of data to enable the management of these resources

Demography, monetary increase, destruction of traditional societies lead to very large increases in the demand for reef fish

Reef fish communities are the most complex vertebrate communities known at present



Diversity of Shore Fishes (0-100m depth) within FAO regions



Biodiversity Centre

Meta-Communities – 63 checklists of Shore fishes

Numbers indicate the number of recorded fish taxa - in red: regional lists - in black: island lists

1- The Pacific Region has the highest Diversity of shore fishes in the World

2- This diversity decreases eastwards from a Biodiversity Centre located in Indonesia-China Sea

3- Do Regional Factors act upon the Diversity of Island Meta-Communities ?

Factors introduced in Model

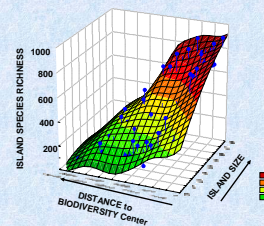
- A - Distance (km) to the Biodiversity Centre (3°S x 125°E)
- B - Island Size (log scale - km<sup>2</sup>)
- C - Reef Size (km<sup>2</sup>) around the islands
- D - Degree of Isolation : distance (km) to the nearest islands
- E - Latitude : relative to the Biodiversity Centre

Multiple regression

(forward stepwise using a GLM)

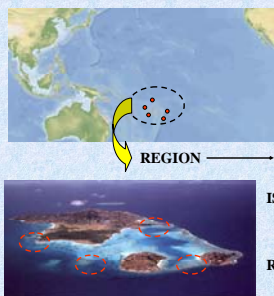
$$\text{META-COMMUNITY DIVERSITY} = 305.2 + 73.72 \log(\text{ISLAND SIZE}) - 0.0206 \text{ DISTANCE to B.C.} + 0.0037 \text{ REEF SIZE}$$

$R^2 = 0.88$  N = 56

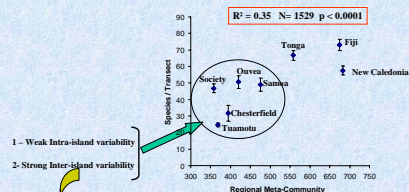
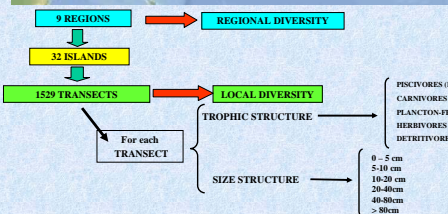
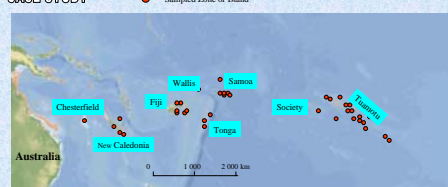


4- Is Local Diversity (Observed at the reef level) linked to Meta-Community Diversity?

DEFINITIONS



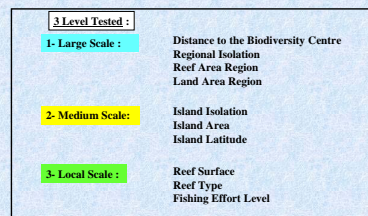
CASE STUDY



- 1- Weak Intra-island variability
- 2- Strong Inter-island variability

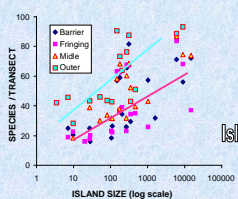
- 1- Other Factors than Meta Diversity are influential
- 2- These Factors intervene at various Scales

5- Are Local Factors more important than Large Scale Factors in setting Local Diversity ?

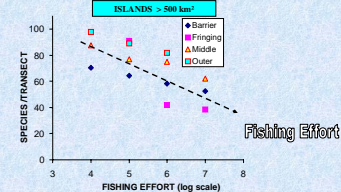


Large Scale (Region) + Medium Scale (Island) > Local Scale (Reef)

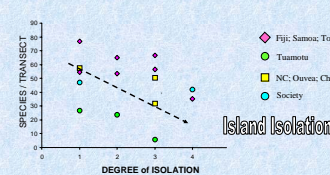
Examples



Island Size



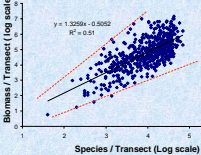
Fishing Effort



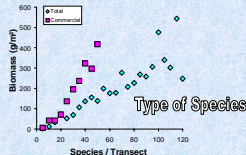
Island Isolation

6- Is Biomass related to Local Diversity?

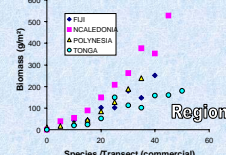
Examples



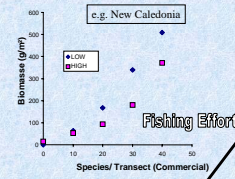
Large Variance due to a combination of Local & Large Scale Factors



Type of Species



Region



Fishing Effort

7- Applications to Management Example in Fiji

Standardised Methods Targeting Fisheries  
Fish: UVC Distance Methods  
Environment: Remote Sensing Approach  
Socio-Economics: Closed fully-structured questionnaires

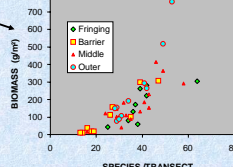
Map of Study Area



MAPPING



45 x TRANSECTS

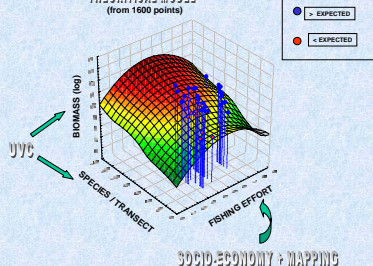


UVC data

SOCIO-ECONOMY

FISH CONSUMPTION : 2.48 kg/week/person  
FISH LEAVING THE VILLAGE : 600 kg/week  
NUMBER OF PEOPLE depending of this reef : 300 persons

THEORETICAL MODEL (from 1600 points)



Observed Values  
• > EXPECTED  
• < EXPECTED

SOCIO-ECONOMY + MAPPING

1. IRD - Université de Perpignan - 66860 - France  
2. IRD - Nouméa - B.P.45 - 98848 - Nouméa - Nouvelle Calédonie  
3. EPHE - Université de Perpignan - 66860 - France  
4. CPS - B.P. 05 - 98848 - Nouméa - Nouvelle Calédonie  
5. Université de Nouvelle Calédonie - Nouméa - Nouvelle Calédonie