Biological Connectivity in the Samoan Archipelago

DMWR Fisheries

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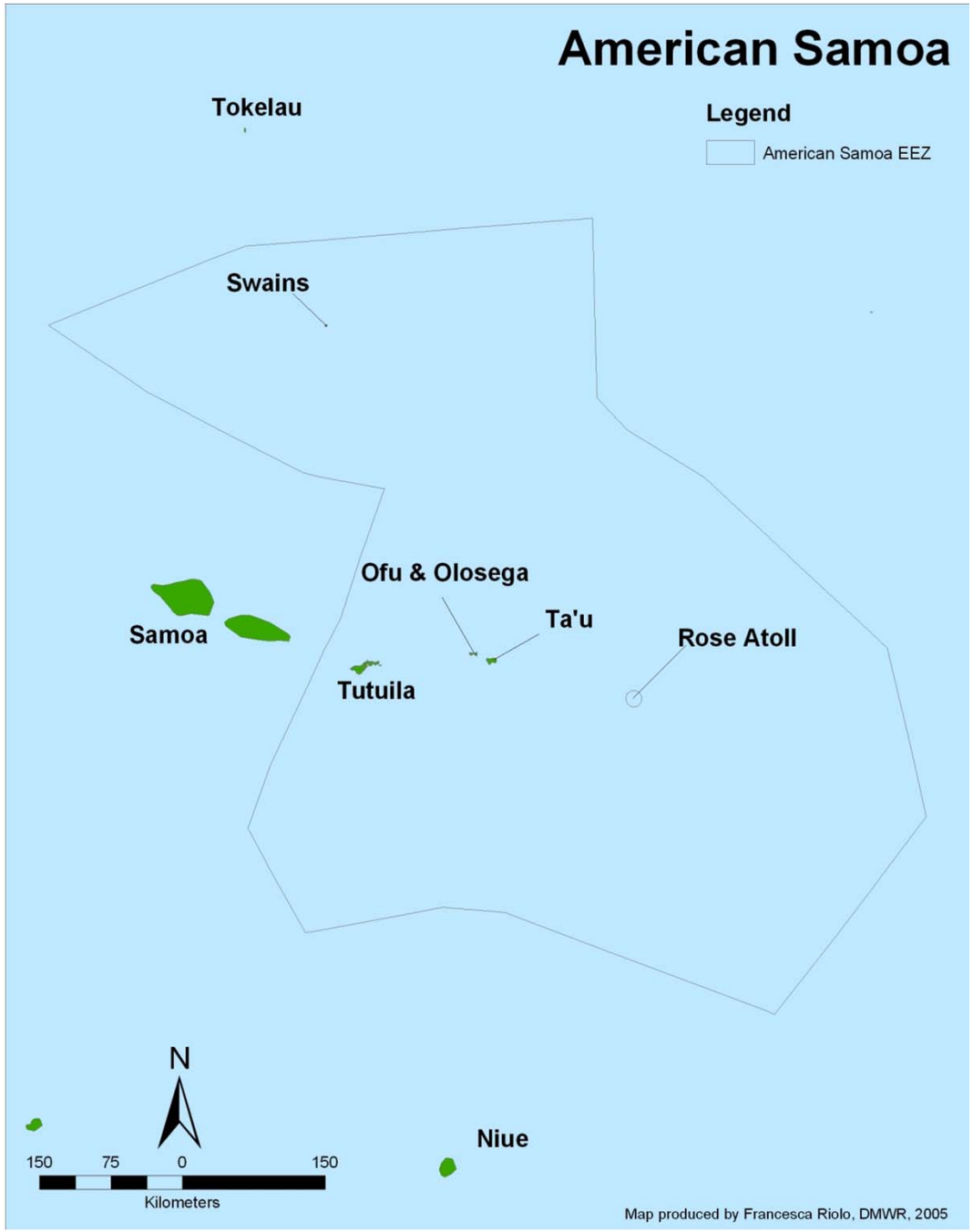
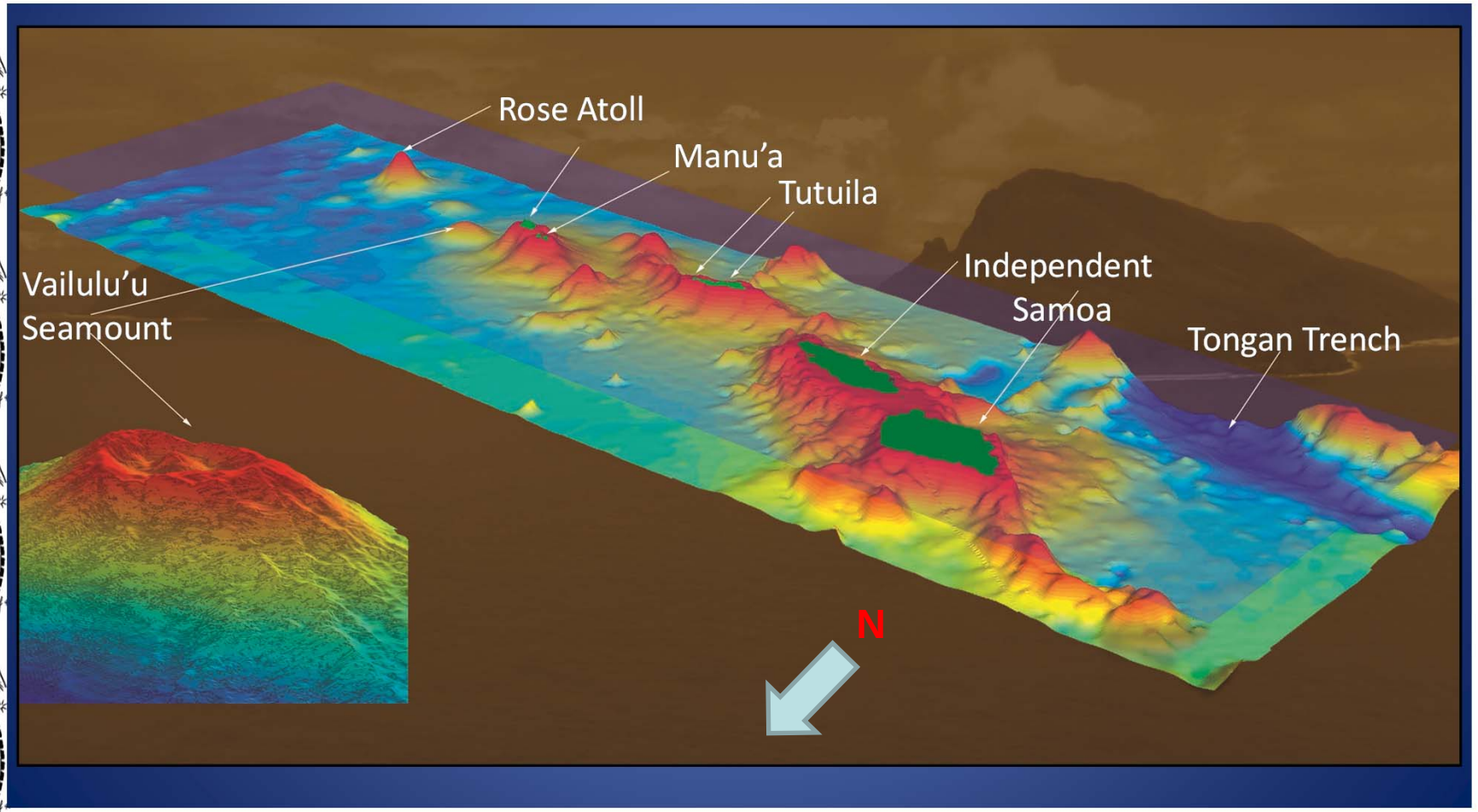
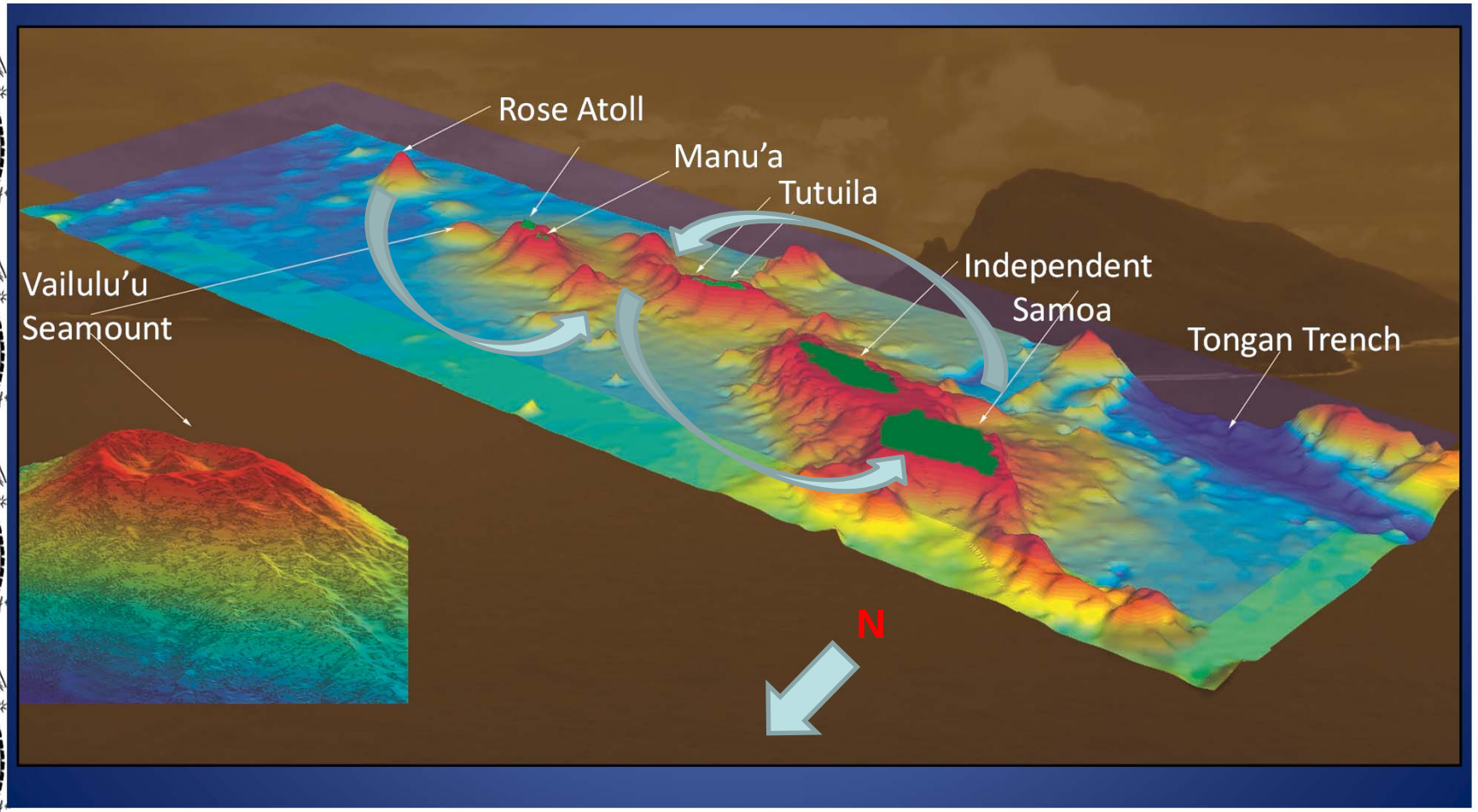
L Jacob-Wiles, P Wiles, A Lawrence, T Aitaoto,
D Wilson, M Kendall, M Poti


American Samoa
Tokelau
Legend
American Samoa EEZ
Swains
Ofu & Olosega
Ta'u
Samoa
Rose Atoll
Tutuila
N
150 75 0 150
Kilometers
Niue
Map produced by Francesca Riolo, DMWR, 2005

Samoa Archipelago



Hypotheses in Samoan Archipelago Connectivity

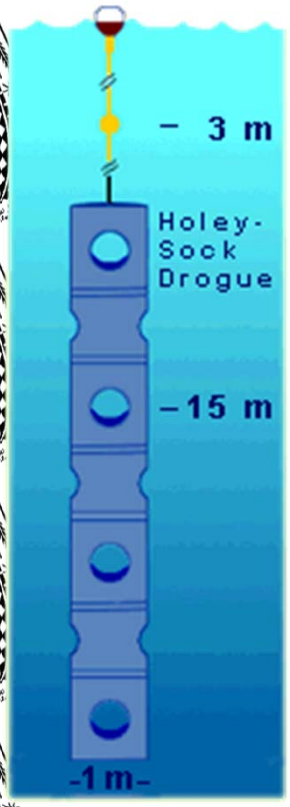


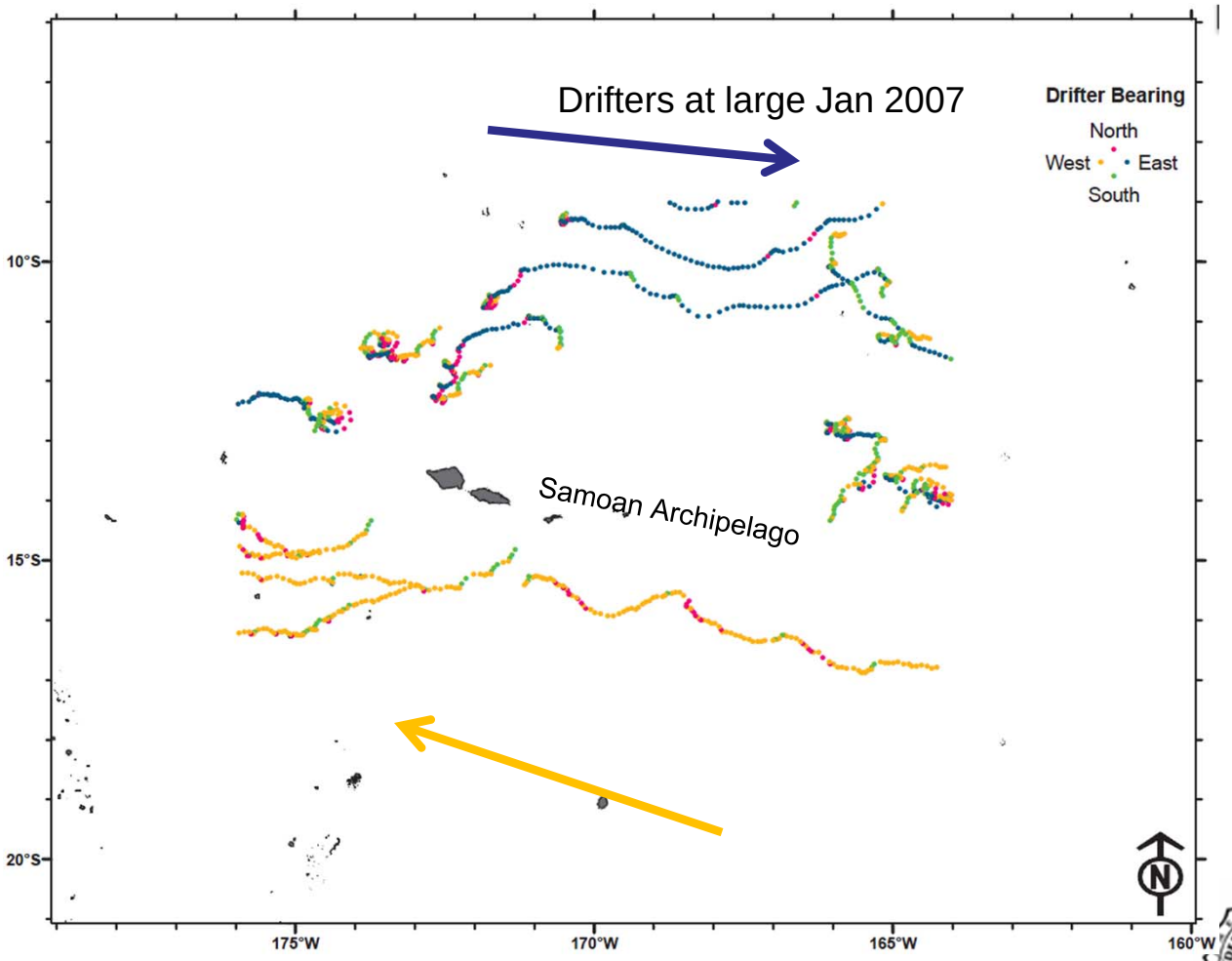
Biological Connectivity projects

1. Large-scale Oceanographic patterns – Global Drifters
2. Sub-island scale currents (Tutuila) – ADCP/GPS Drifters
3. Patterns in fish demography – Tutuila & Manu'a
4. Patterns in coral community assemblages - archipelago
5. Fish Population genetics – Samoa archipelago

1. Large Scale Oceanographic Patterns

Satellite-tracked drifters (n = 216); Global Drifter Program

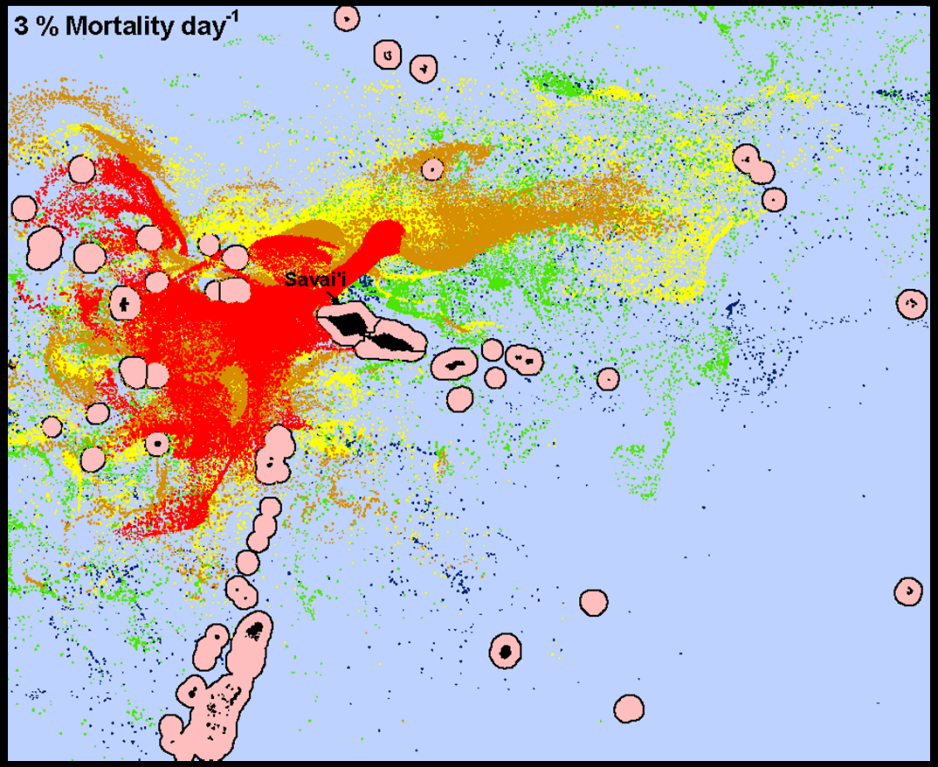




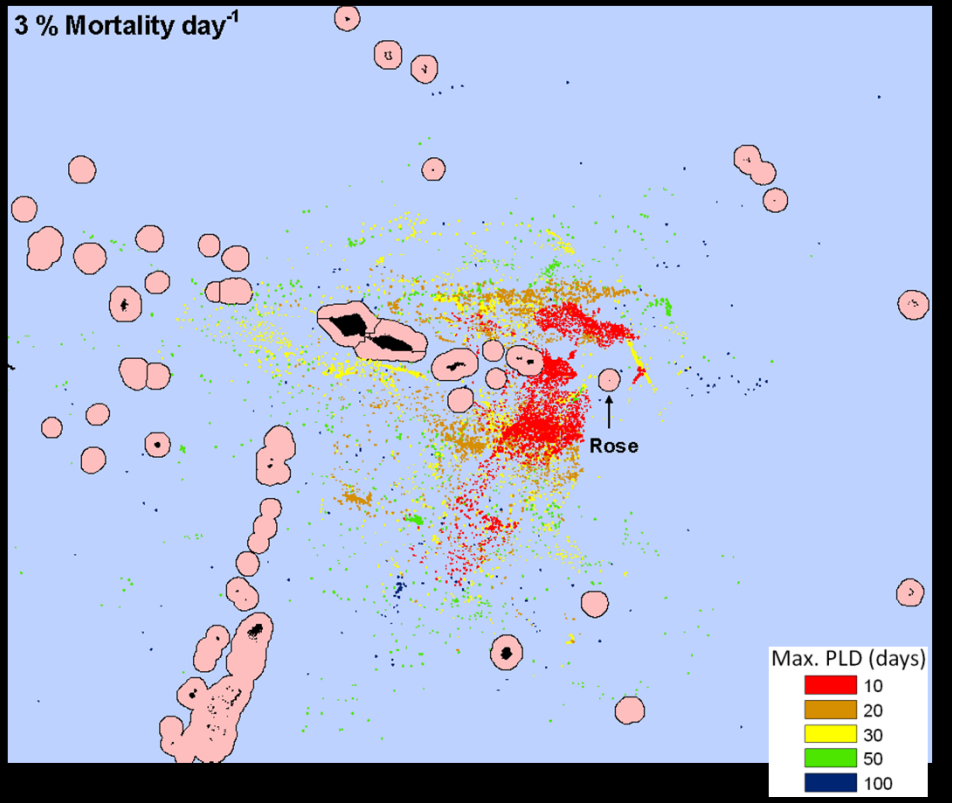
Biogeographic Assessment of the Samoan Archipelago

Computer numerical modelling

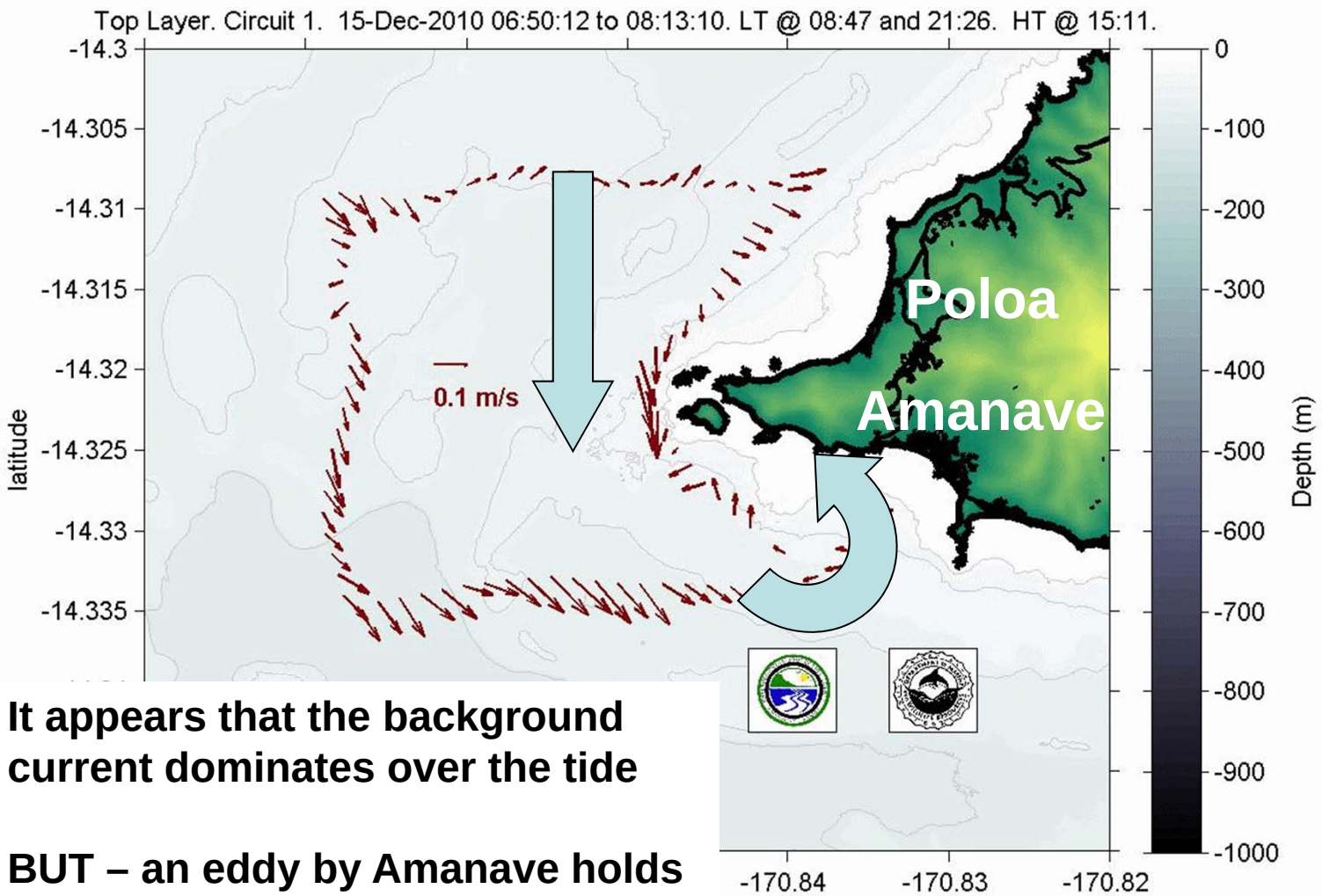
N. Savai'I as larval source



Rose Atoll as larval source



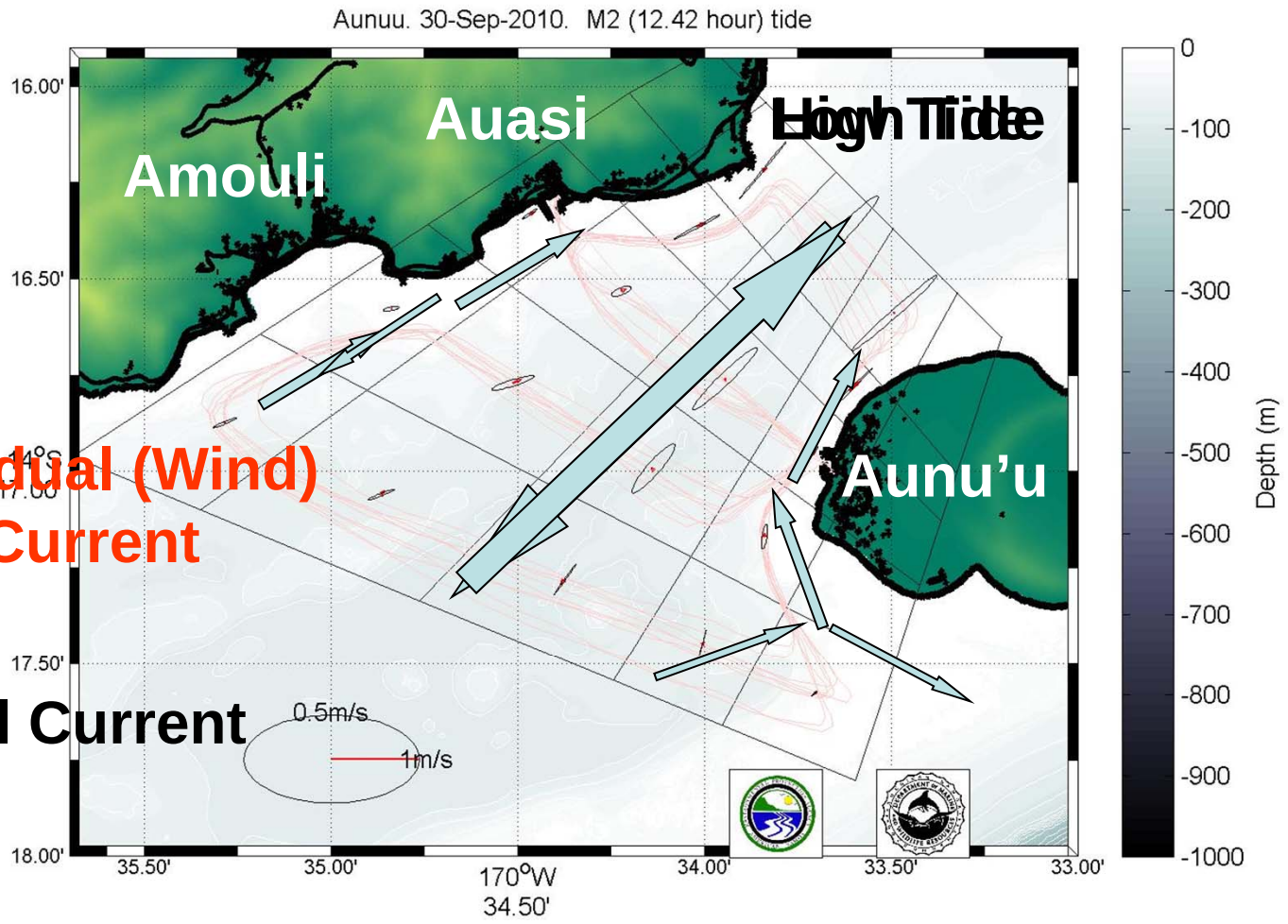
Amanave



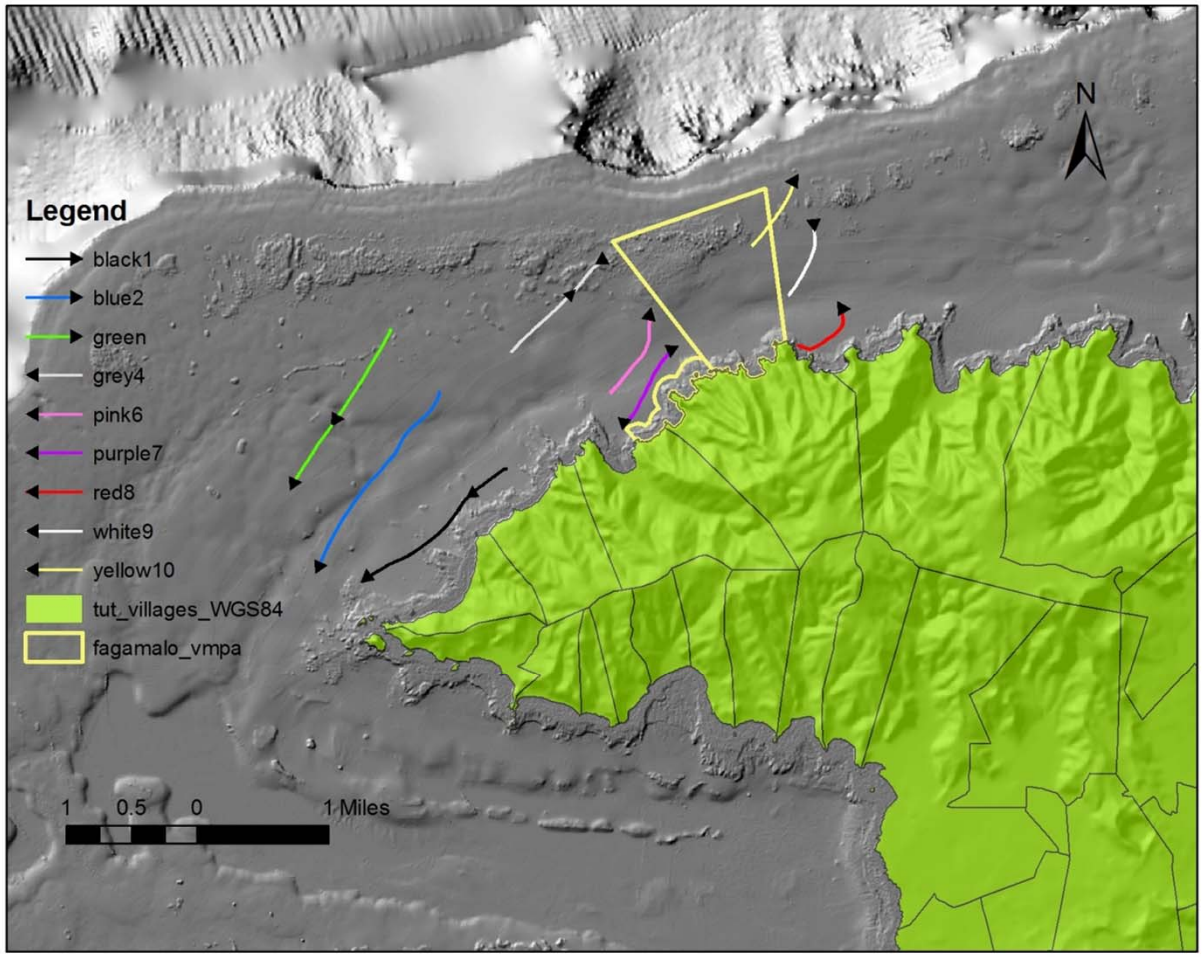
It appears that the background current dominates over the tide

BUT – an eddy by Amanave holds larvae close

Aunu’u – Auasi Channel



3. Sub-island scale currents - GPS Drifters



4. Fish demographic patterns

- Demographic plasticity in the hindtail grouper, *Cephalopholis urodeta*

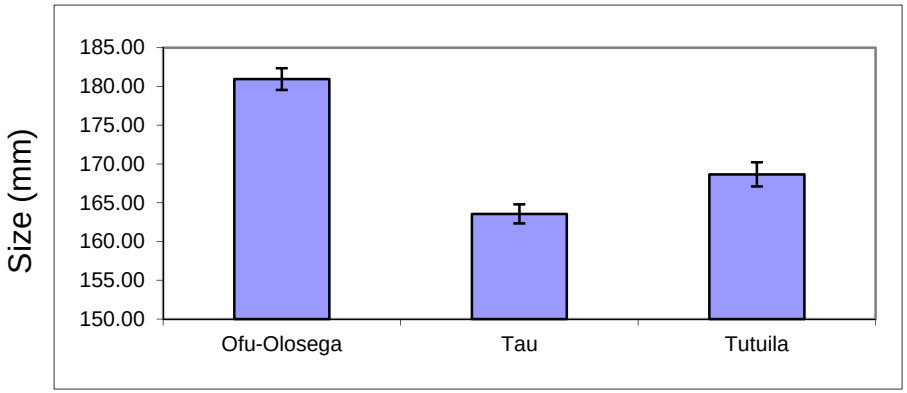
- Over 400 fish collected in Tutuila and Manu'a Islands in 2001-2002

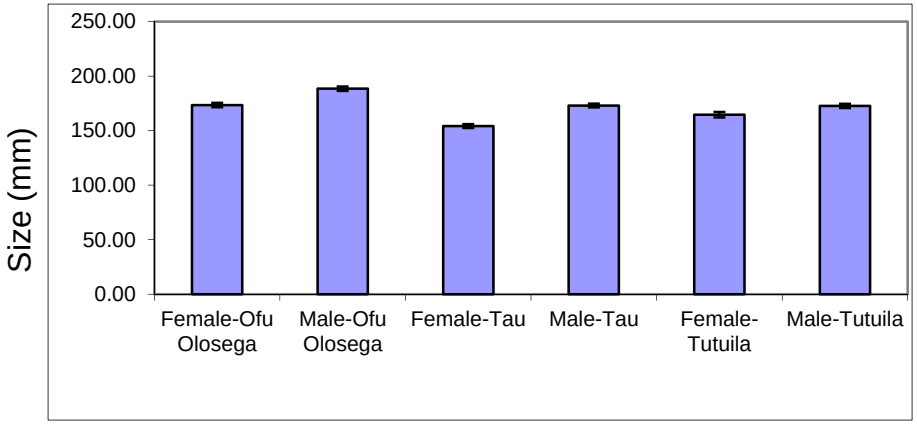
Determine patterns in:

- **Size** - length
- **Condition index** – overall health, compare to expected weight
- **Longevity** - Otoliths were collected, rings counted to age fish
- **Sex** - determined by visual inspection of gonads.

Domingo Ochavillo, Marlowe Sabater, Dave Wilson

Size Distributions

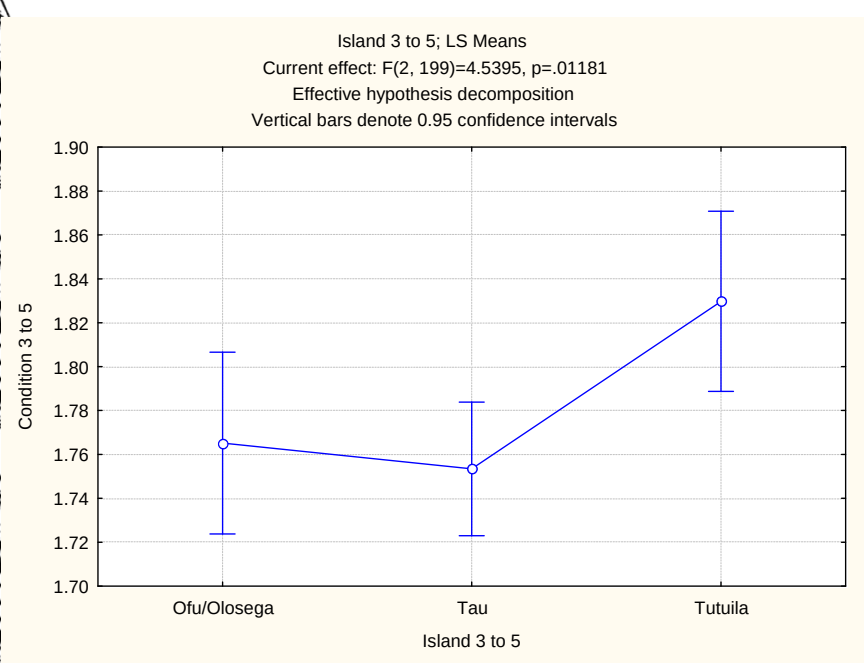


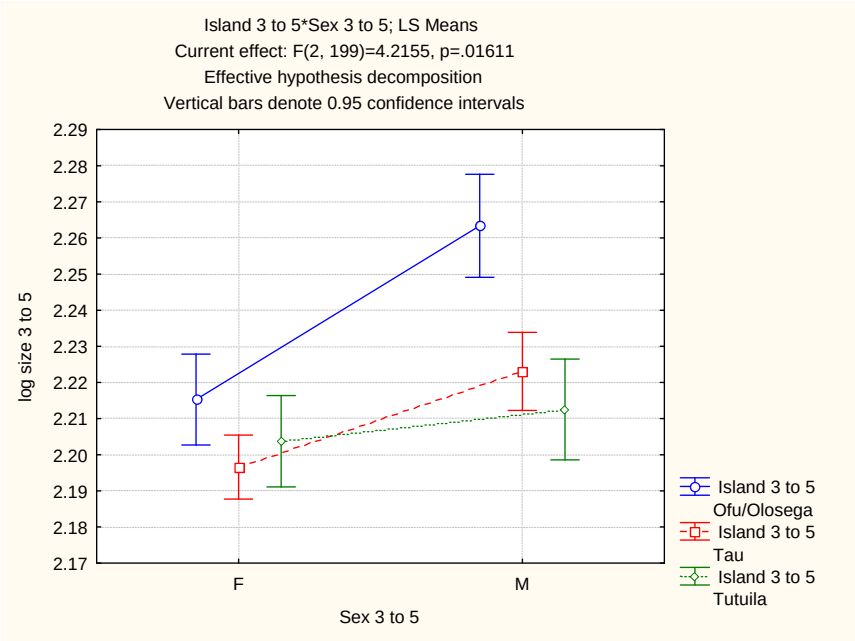


Conclusion:

- Size distribution differences among islands
- Differences between sexes
- but not consistent between sexes among islands

Condition index (3 to 5 years old)

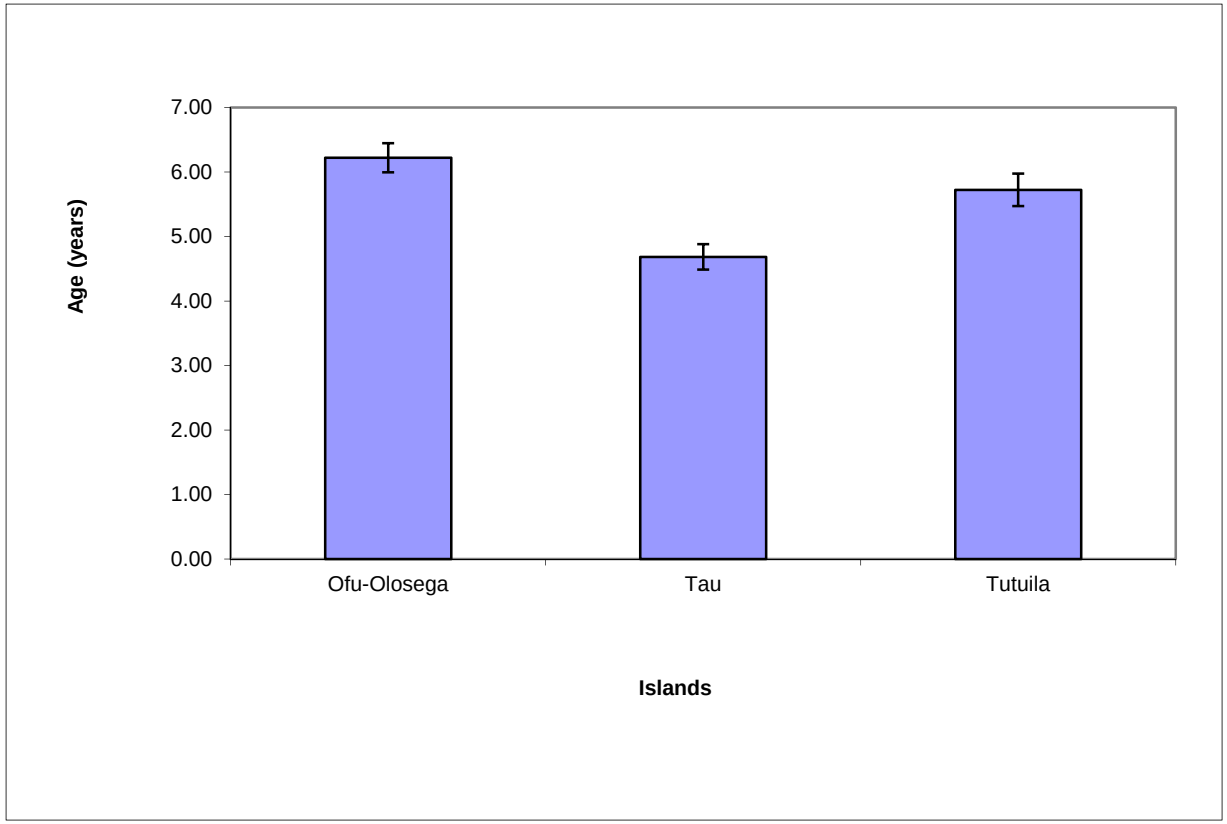




Differences among islands.

Males are not always bigger than females.

Longevity: Age Distributions



Data: maximum age of 20% of the oldest fish in each island.

Conclusion: Age differences among islands.

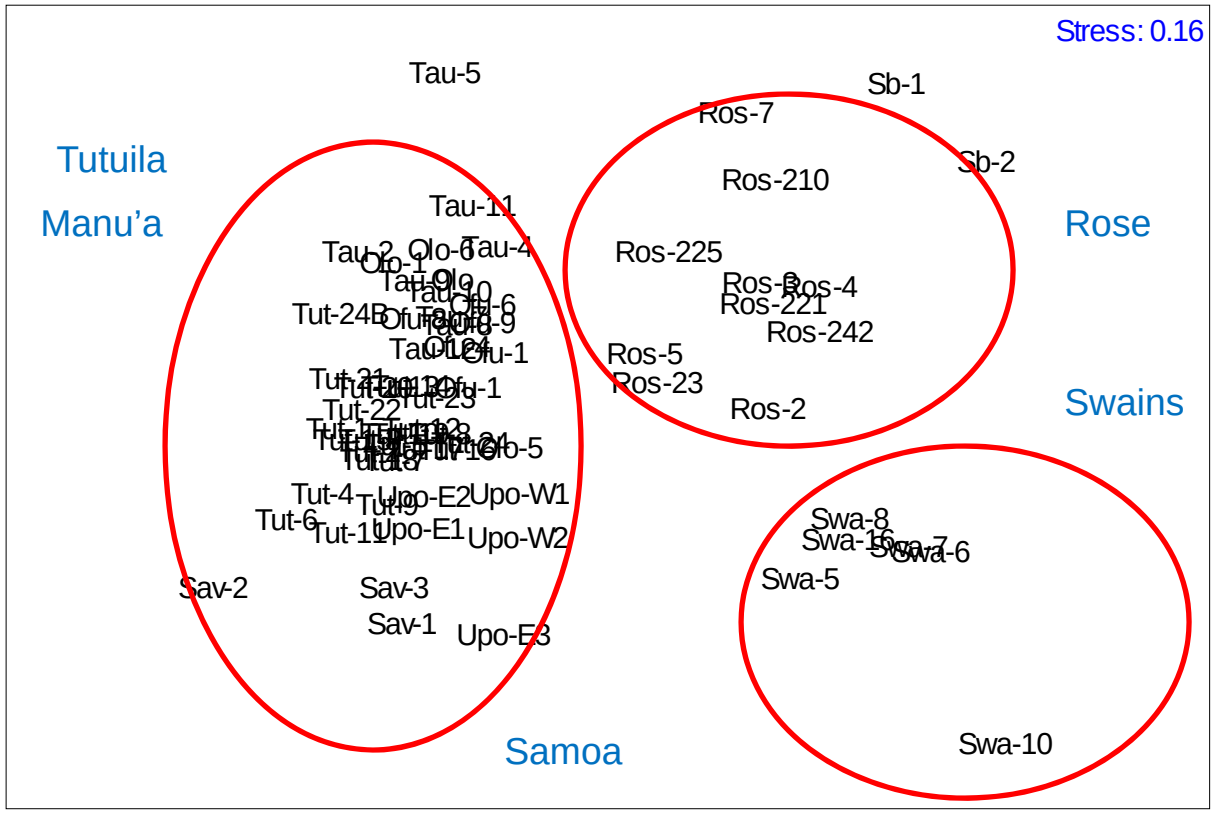
5. Patterns in coral species assemblages

•Characterize coral species assemblages among the islands and atolls in the Samoan Archipelago.

•Patterns in community assemblages could be attributed to differences in connectivity and habitats.

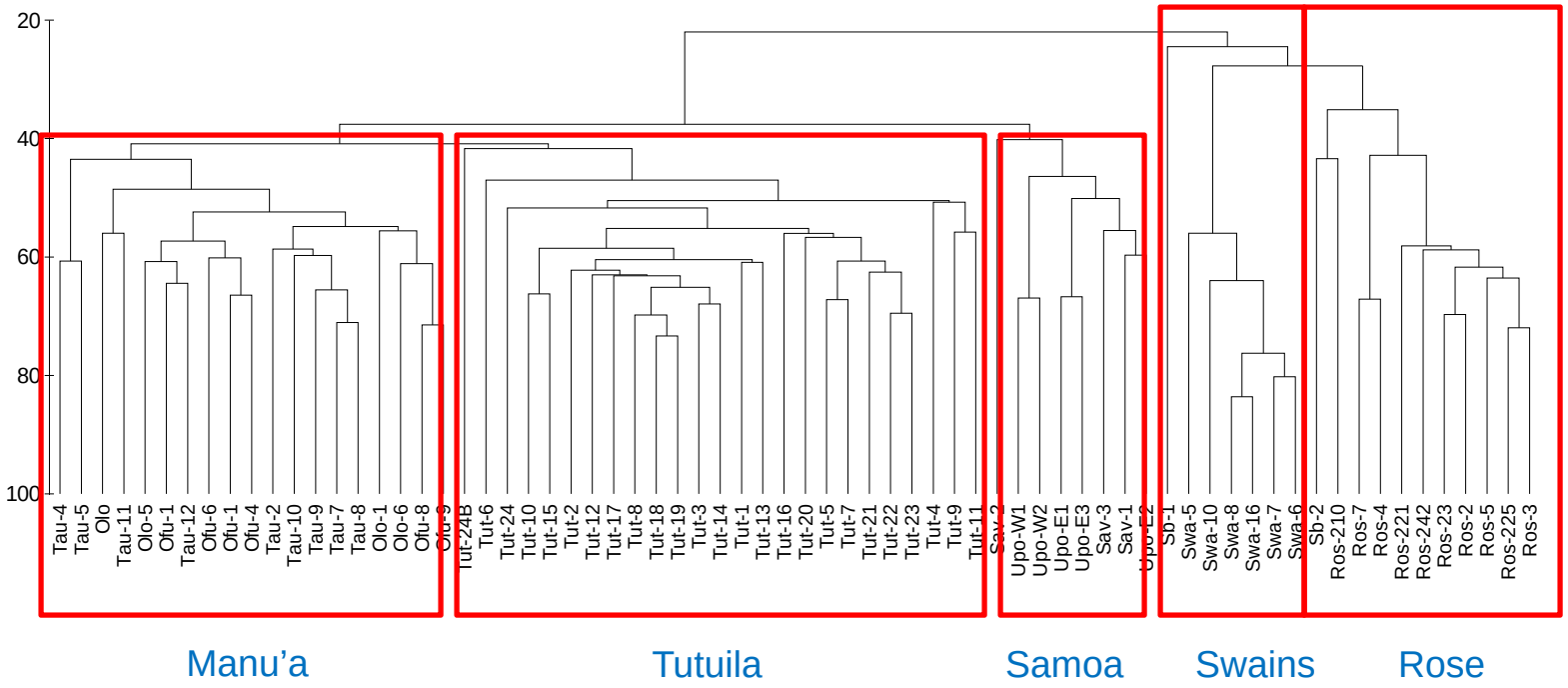
Douglas Fenner and Domingo Ochavillo

Coral species assemblages



MDS Plot

Coral Species assemblages



- Differences in coral species assemblages at various scales – reef type and oceanographic conditions
- Patterns seem to mirror distance patterns which suggest degree of connectivity.

Conclusions

Swains and Rose are different based on coral species, genera and lifeform data analyses.

• Upolu, Savaii, Tutuila and Manua probably of the same habitat based on lifeforms.

• Differences in coral species assemblages between Manua-Tutuila and Upolu-Savaii might indicate some limited connectivity.

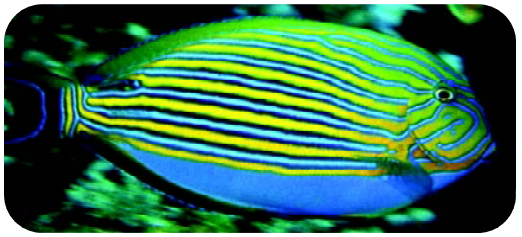
• In a smaller spatial scale, there might be also limited connectivity between Manua and Tutuila.

6. Fish Population Genetics Project

- Population genetics of selected fish species
- **Selection criteria**: abundant, highly targeted
- **Range:** Samoa archipelago except Swains and Rose
- Some fin clips already collected
- Mitochondrial DNA segments already sequenced, samples incomplete
- “Family trees” of mtDNAs will be produced
- Funded by WPRFMC

Myripristis berndti

Acanthurus lineatus



Scarus oviceps

Summary

- Oceanographic patterns reveal connectivity in both within-island and archipelago-wide
- Population demographic patterns indicates island-effect.
- Community assemblages, the groupings were: (1) Rose; (2) Swains; (3) Upolu-Savaii; (4) Manua-Tutuila

Future Work

1. More **ADCP & Drifter** work – Sub-islands oceanographic surveys (extend to Samoa?)

2. UH/PacIOOS Fine Scale High Resolution **Current Models** – around AS (extend to Samoa?)

3. Fish tracking project – in collaboration with National Parks of American Samoa

4. Fish **Population Genetics** Project **-** continue

Fa’afetai tele lava

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Administration and Coordination Staff

Supervisors and Technicians