



Nutrient Monitoring Program

Results

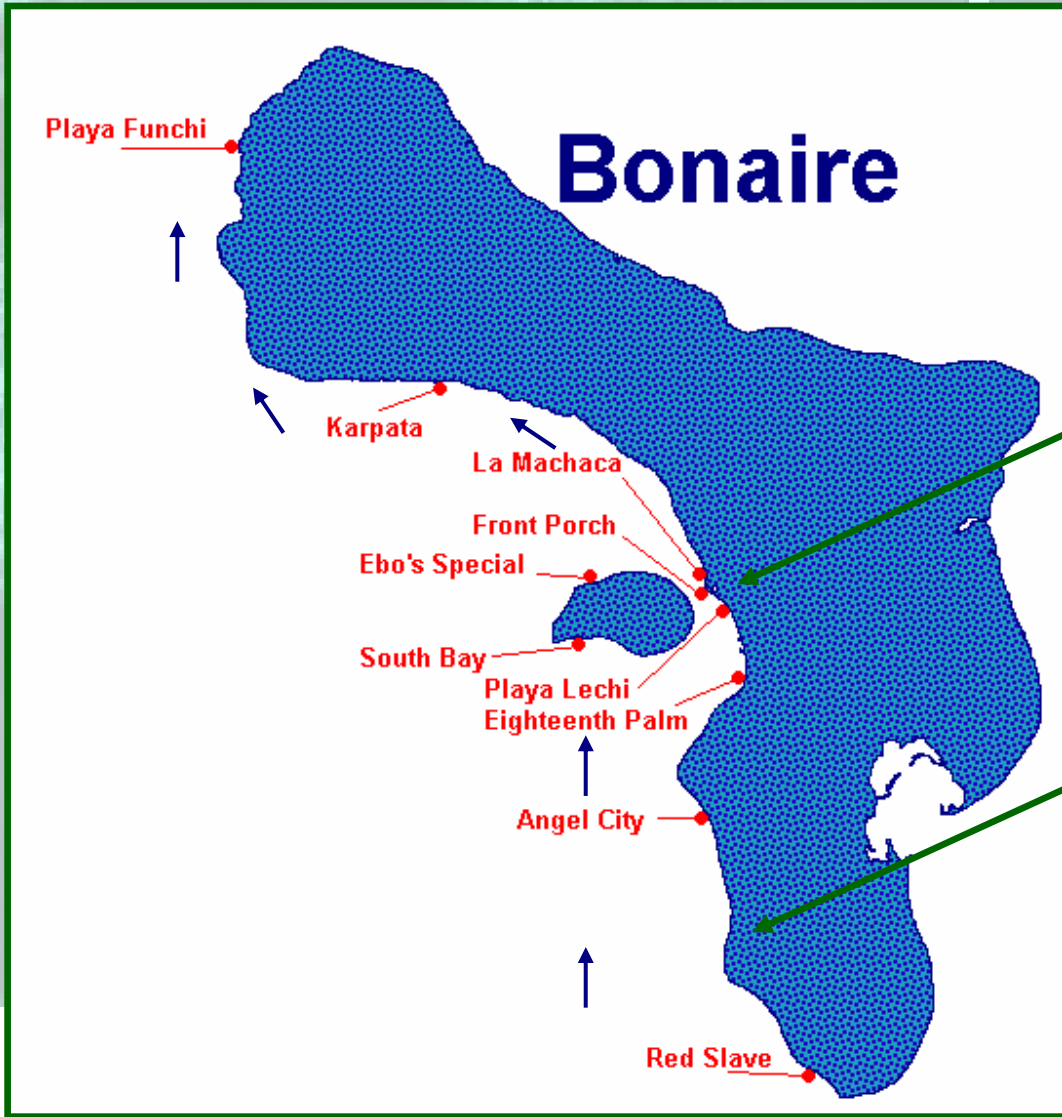
By Mark Wieggers

Outline of the Presentation

- Results of Reef Cover
- Results of Chlorophyll α
- Results of $\delta^{15}\text{N}$
- Results of Nutrients
- Conclusions

Nutrient Monitoring Program

Order of the Data



Kralendijk

Salt
Company

Nutrient Monitoring Program

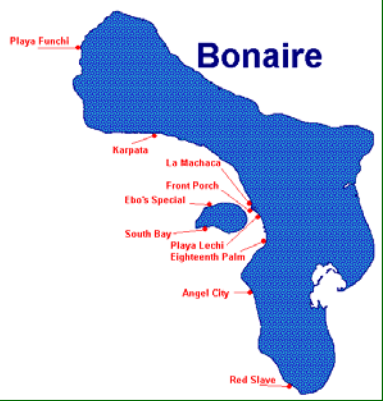
Order of the Data



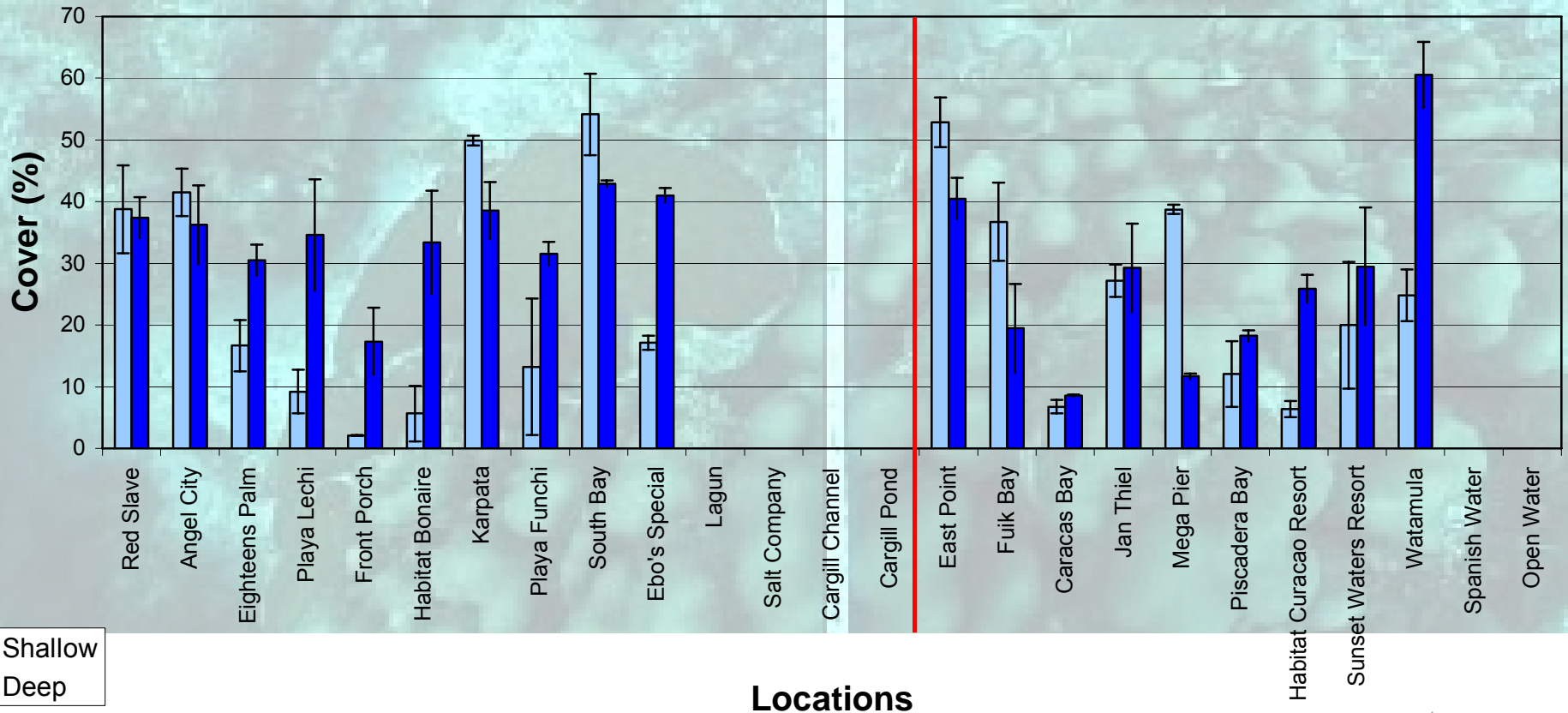
Willemstad

Nutrient Monitoring Program

Results of Coral Cover

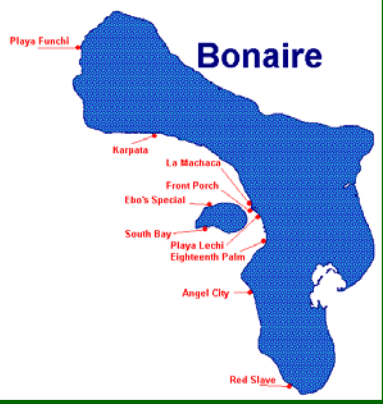


Tukey Test: 10 Groups

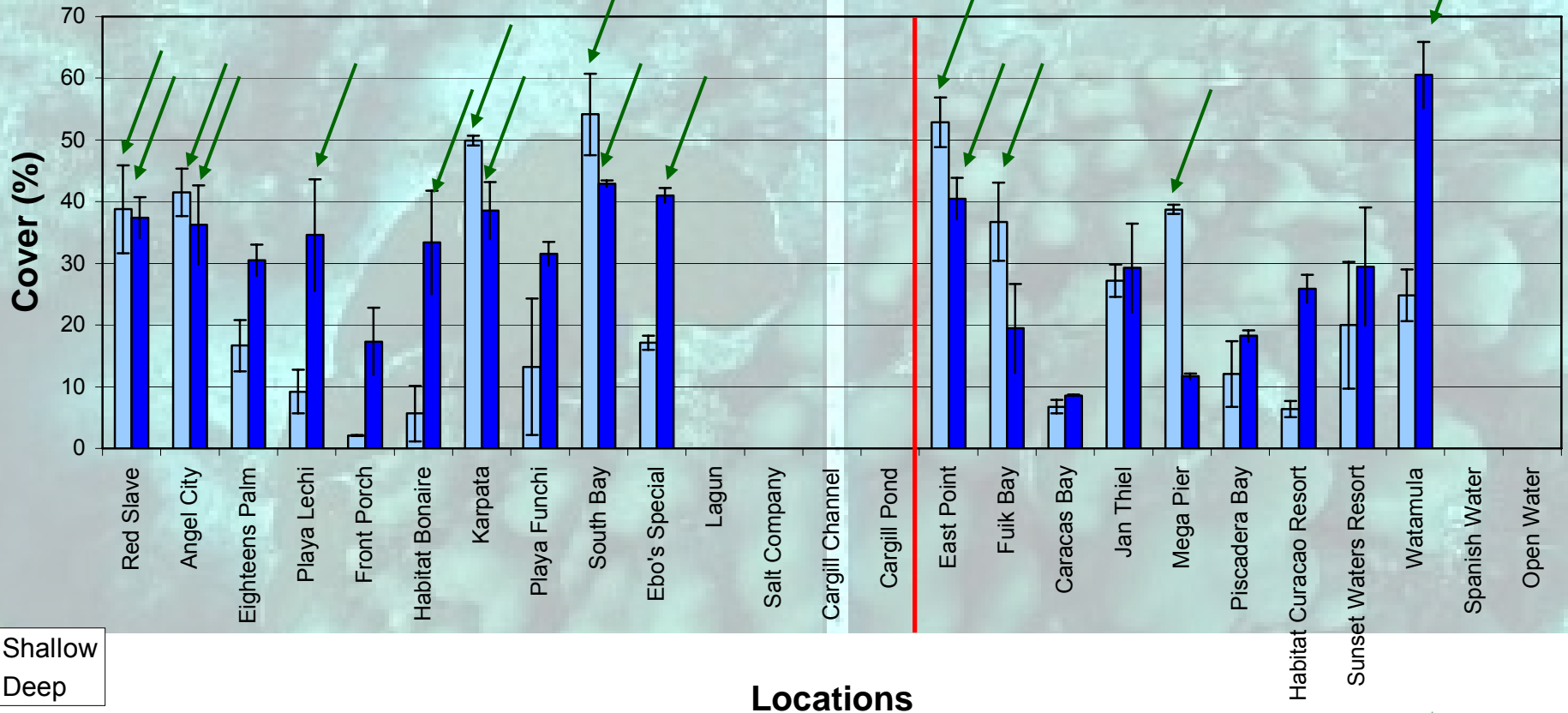


Nutrient Monitoring Program

Results of Coral Cover

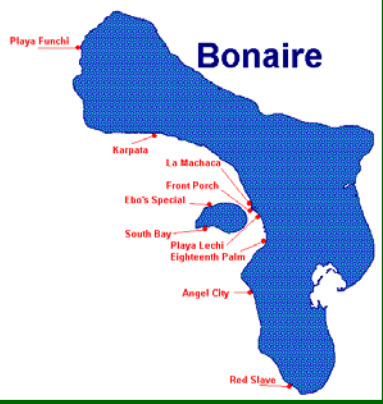


Group 10

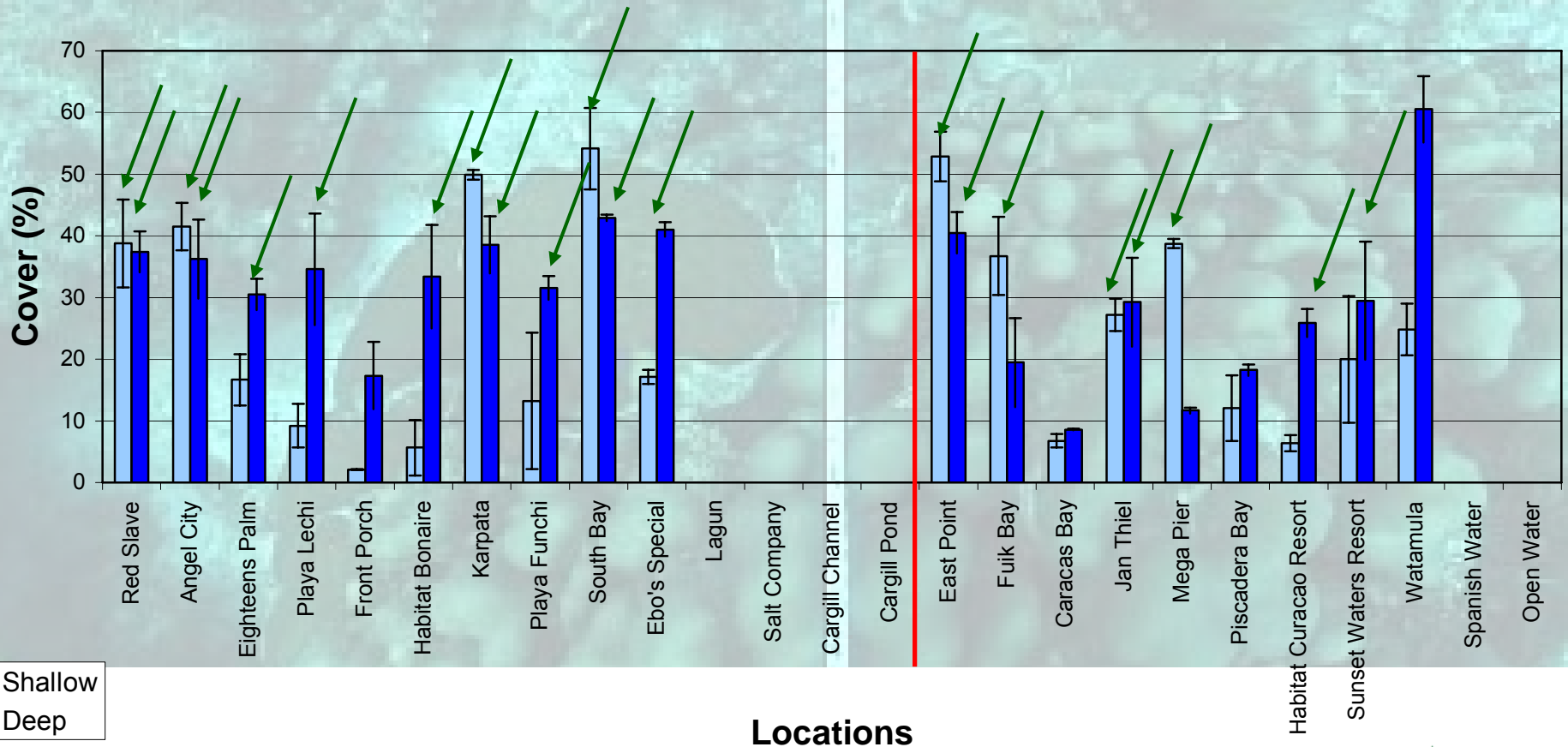


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Results of Coral Cover

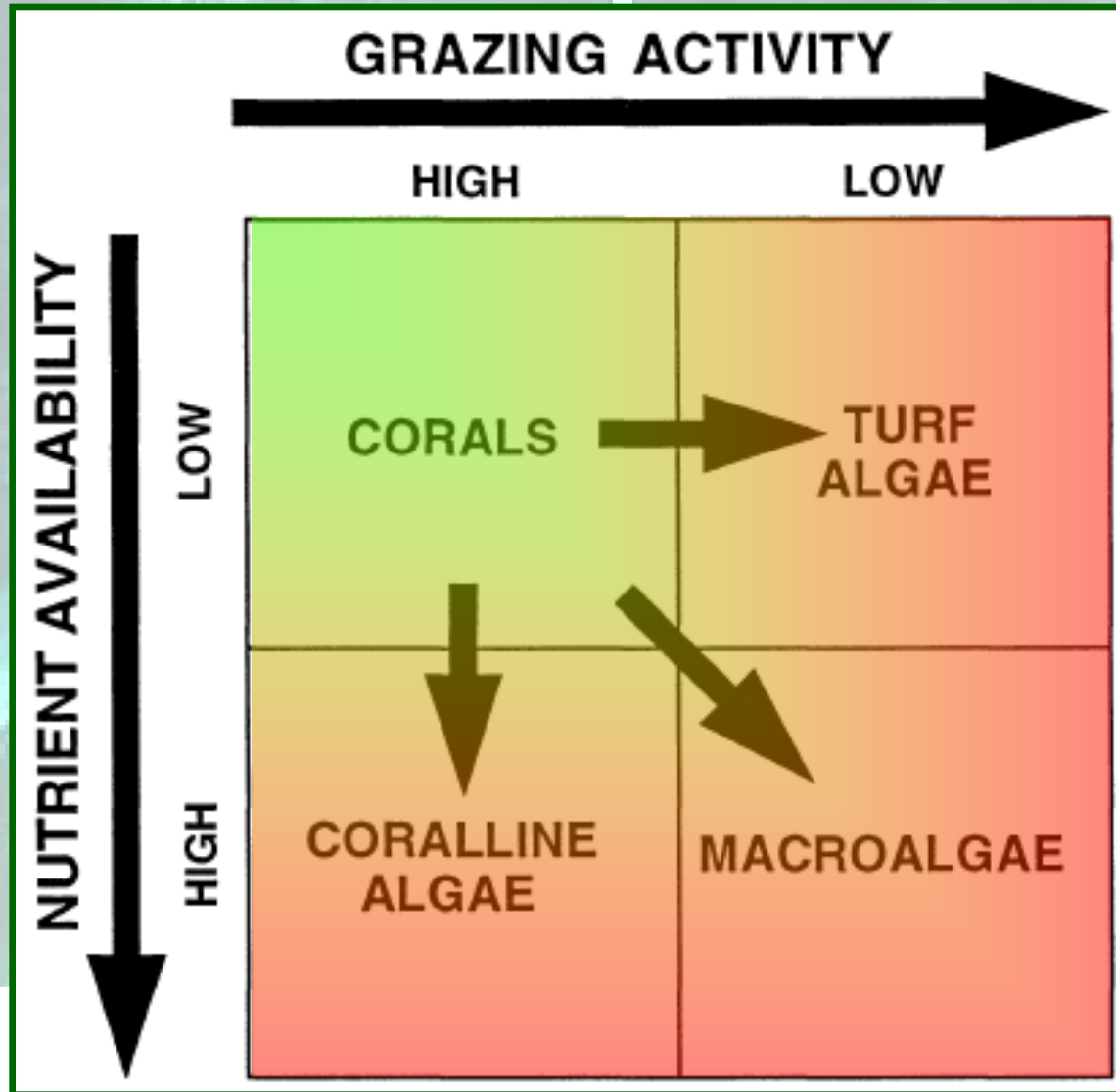


Group 9

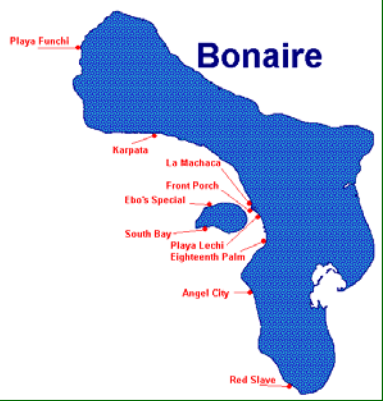


Nutrient Monitoring Program

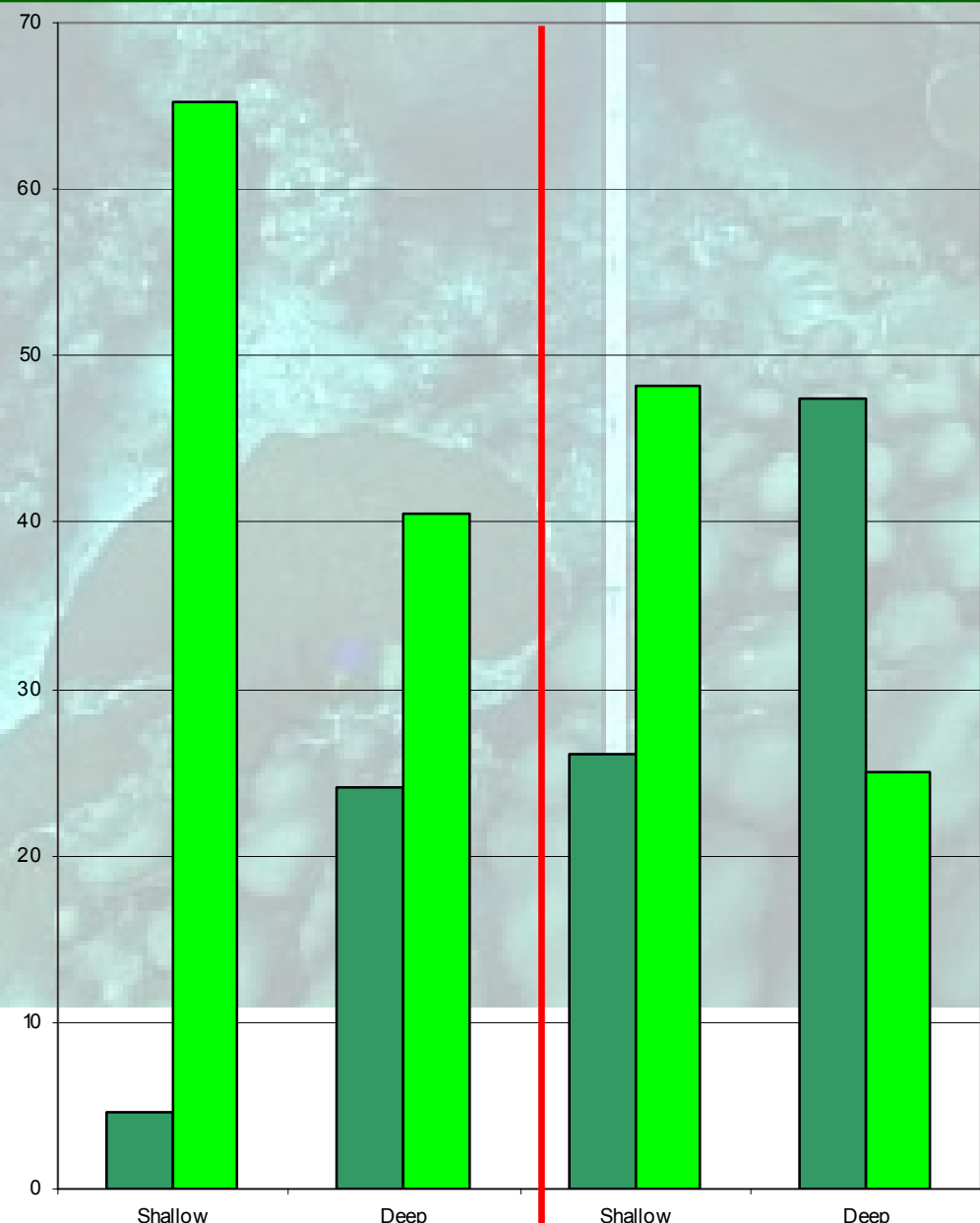
Results of Algae Cover



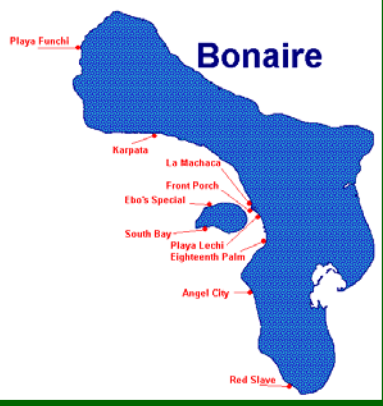
Nutrient Monitoring Program



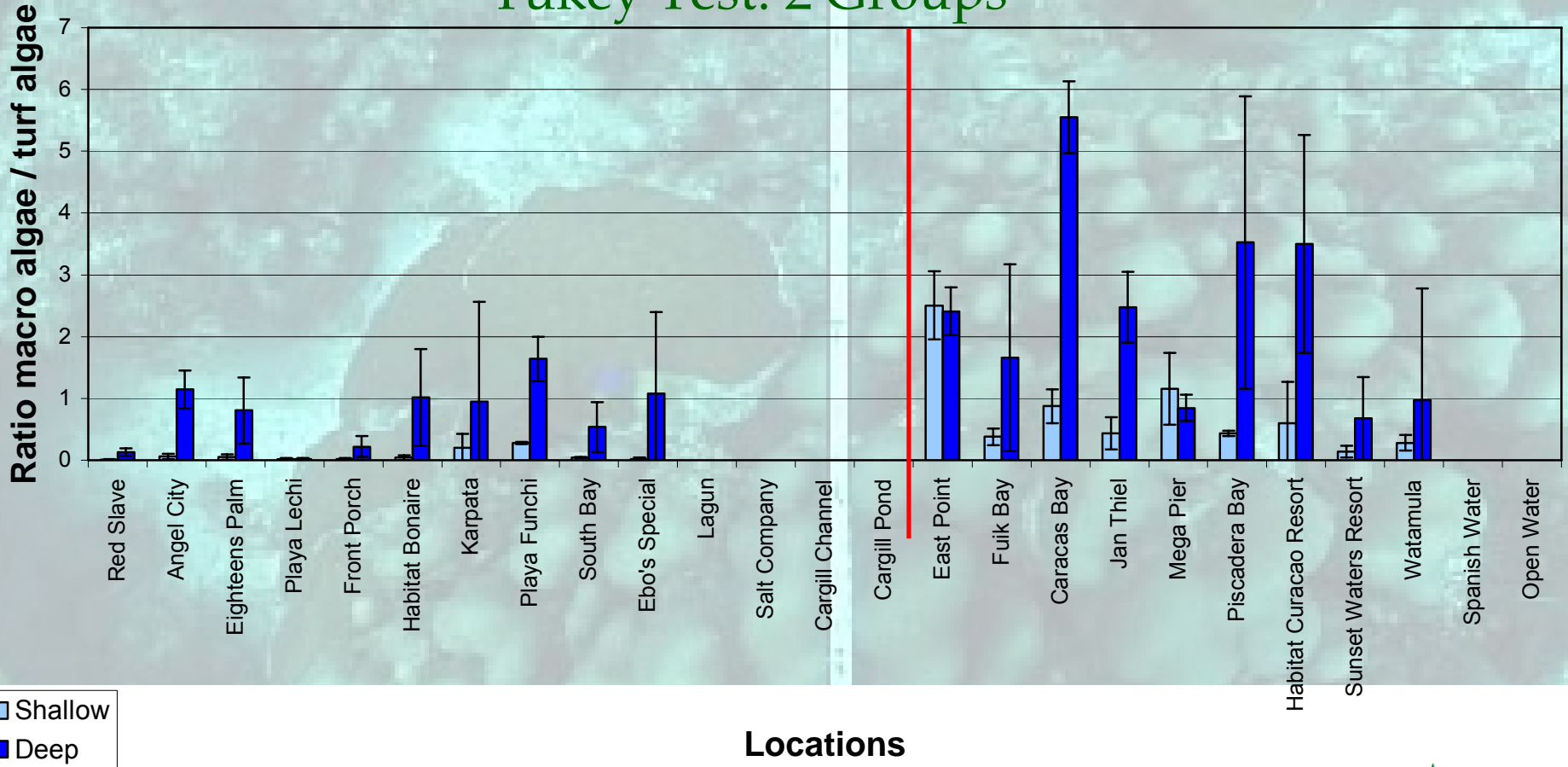
Results of Algae Cover



Results of Algae Cover



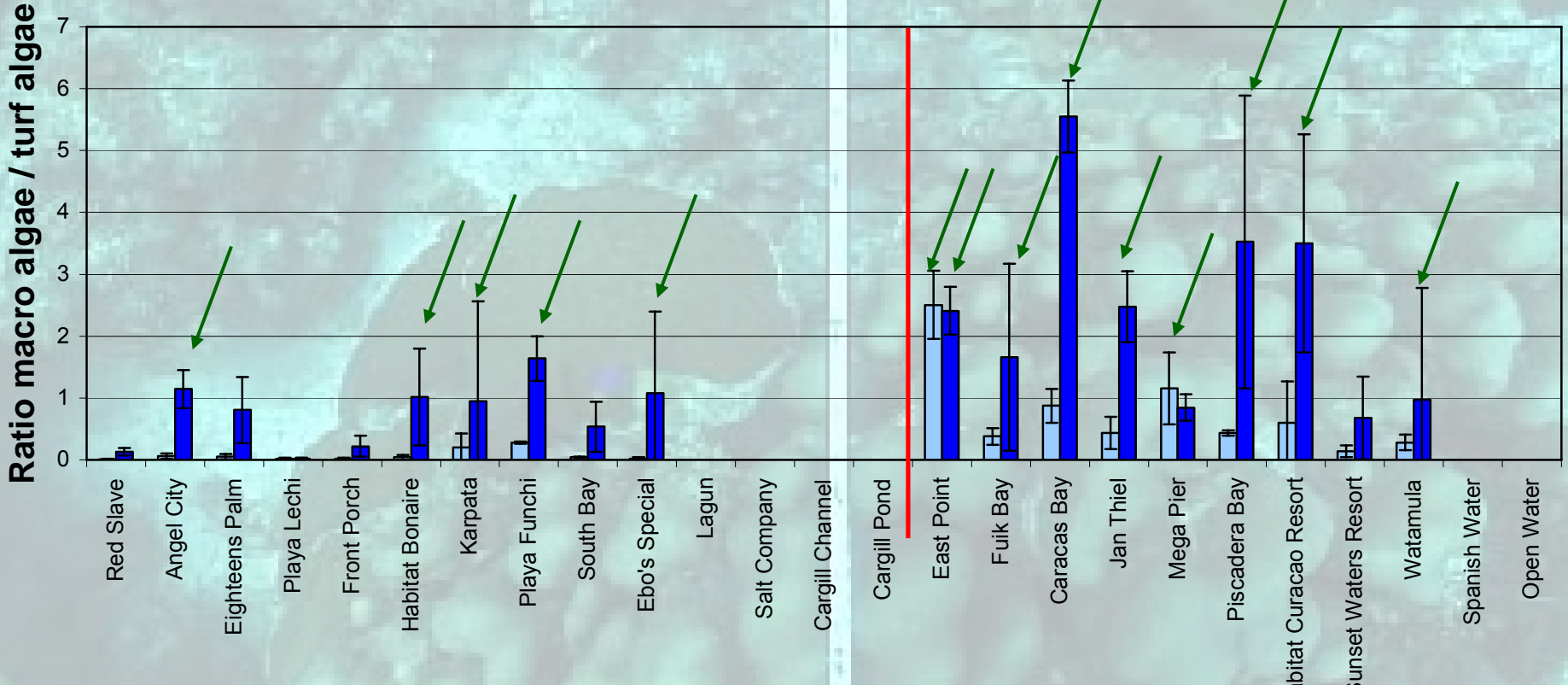
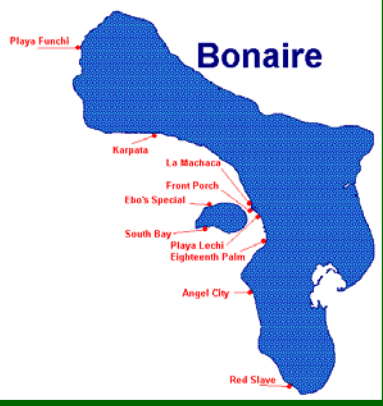
Tukey Test: 2 Groups



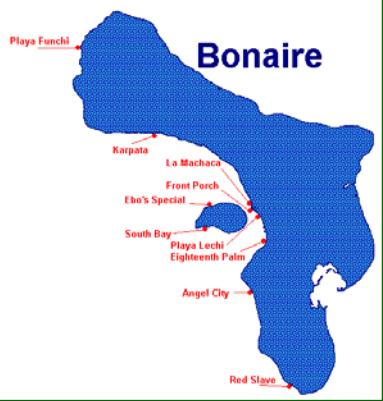
Nutrient Monitoring Program

Results of Algae Cover

Group 2

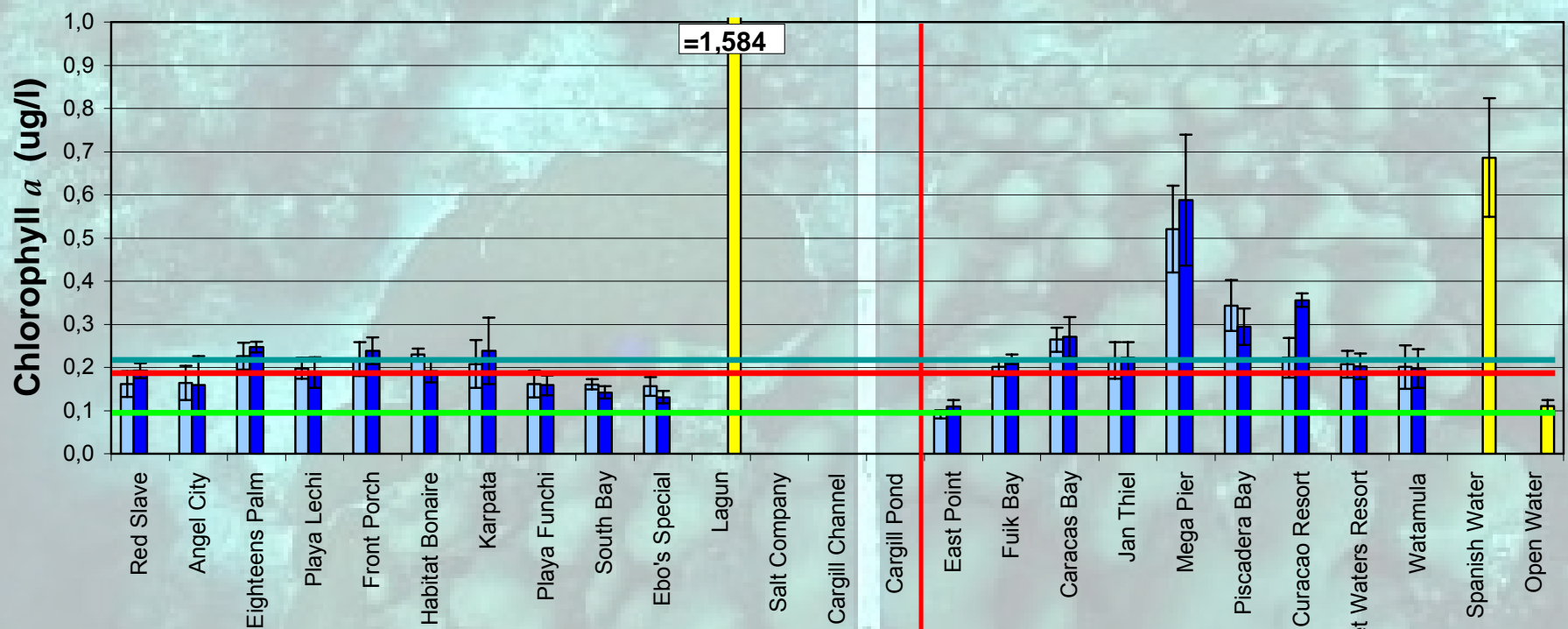


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Results of Chlorophyll *a*

Tukey Test: 5 Groups

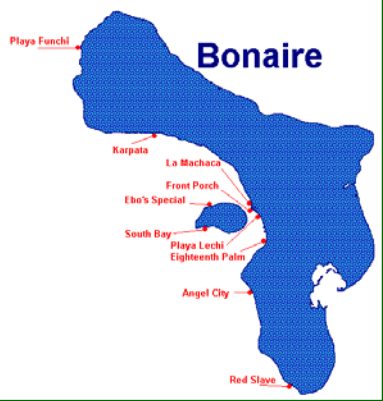


■ Shallow
■ Deep
■ Others

St. Lucia: 0,23

Locations

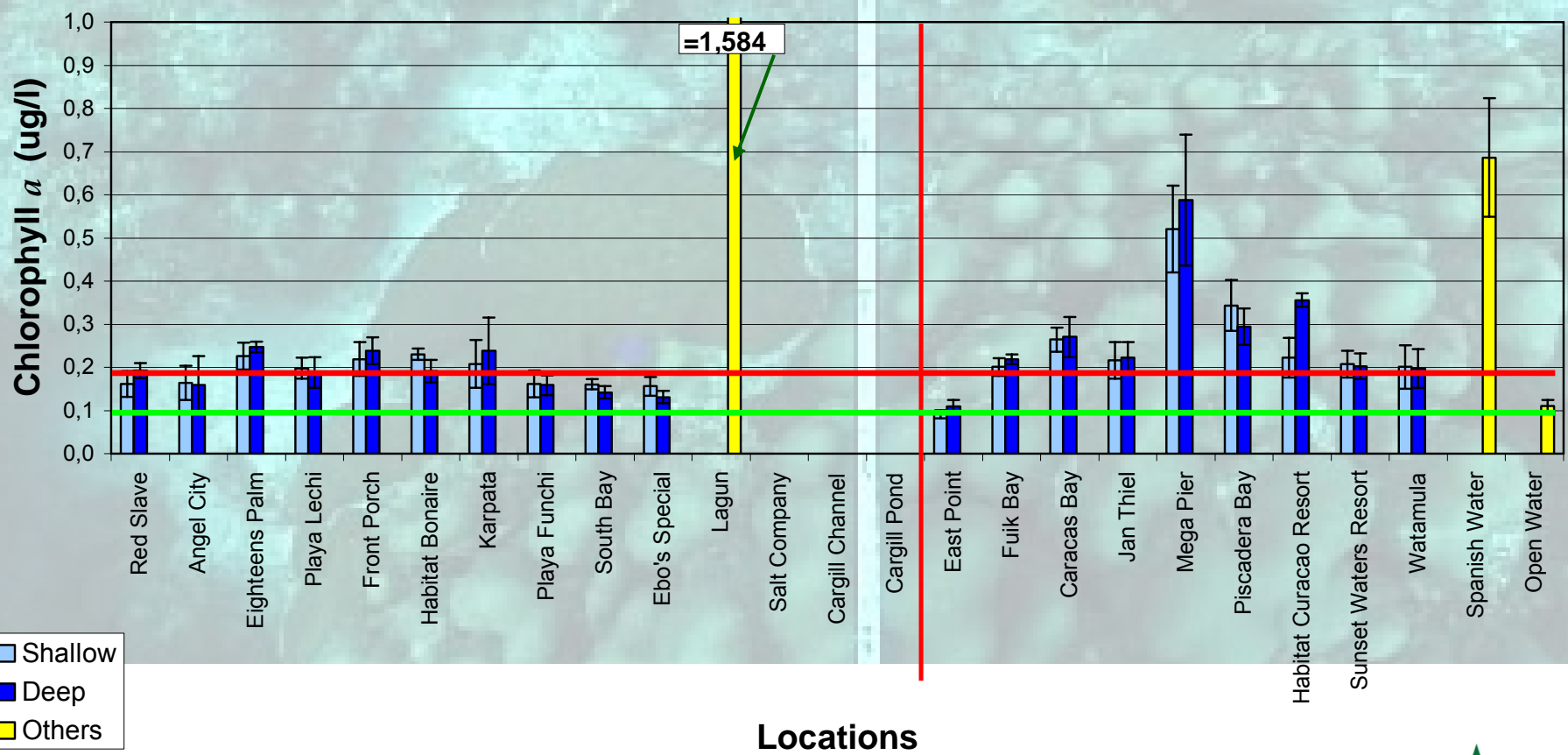
Nutrient Monitoring Program



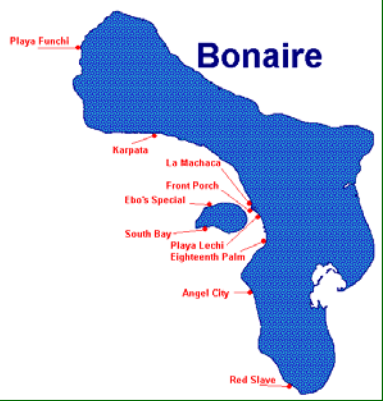
Results of Chlorophyll *a*



Group 5



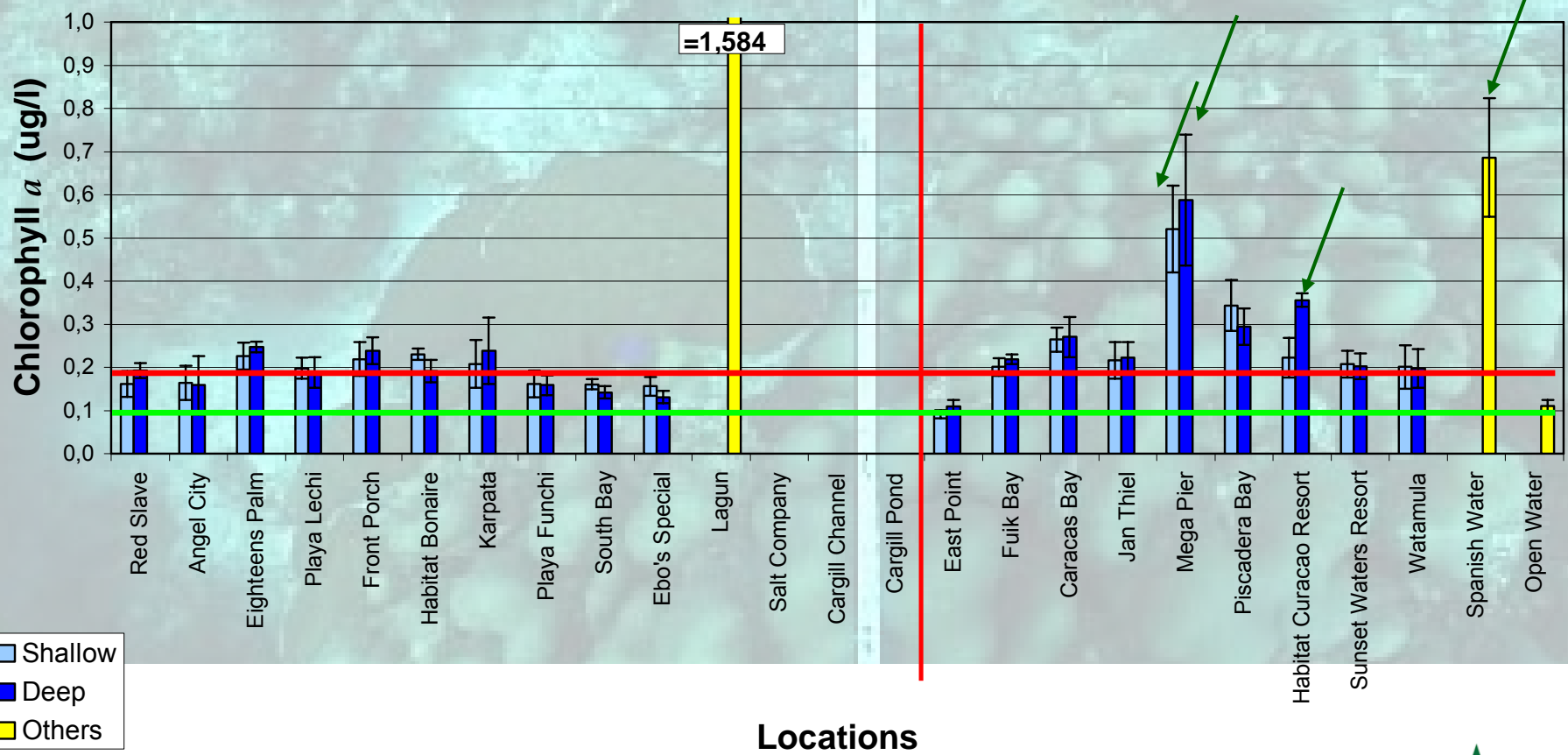
Nutrient Monitoring Program



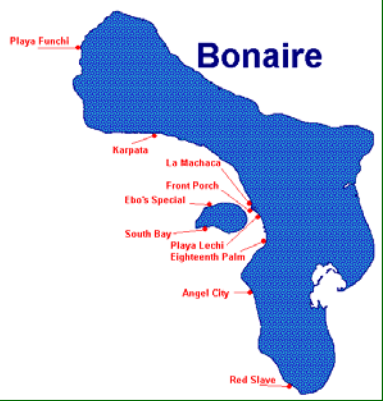
Results of Chlorophyll *a*



Group 4



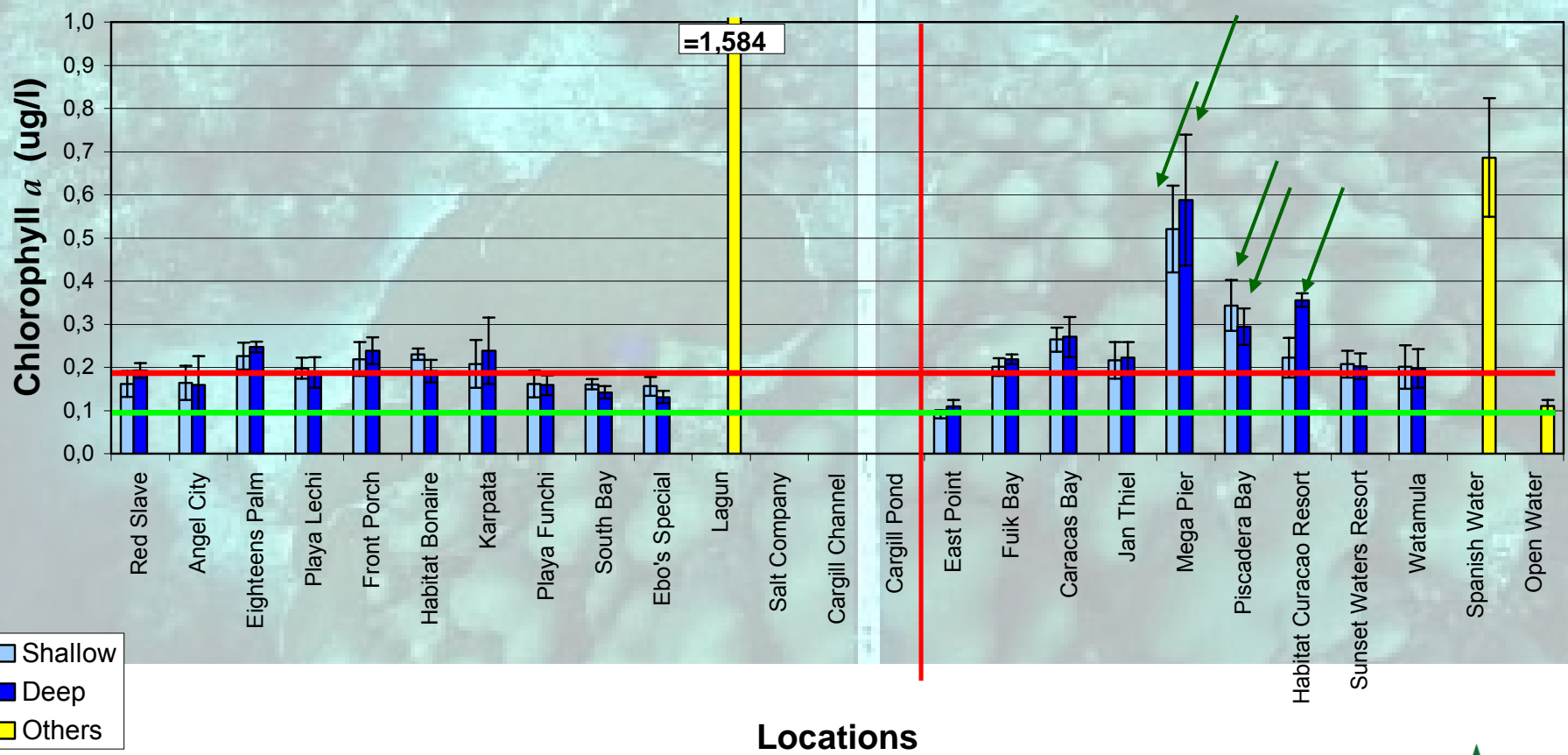
Nutrient Monitoring Program



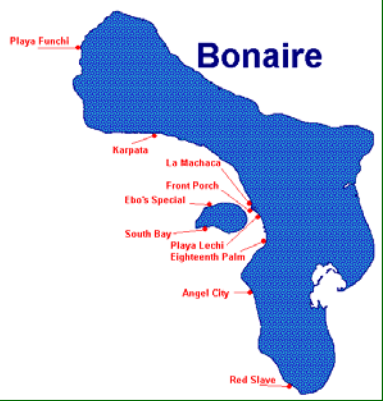
Results of Chlorophyll *a*



Group 3



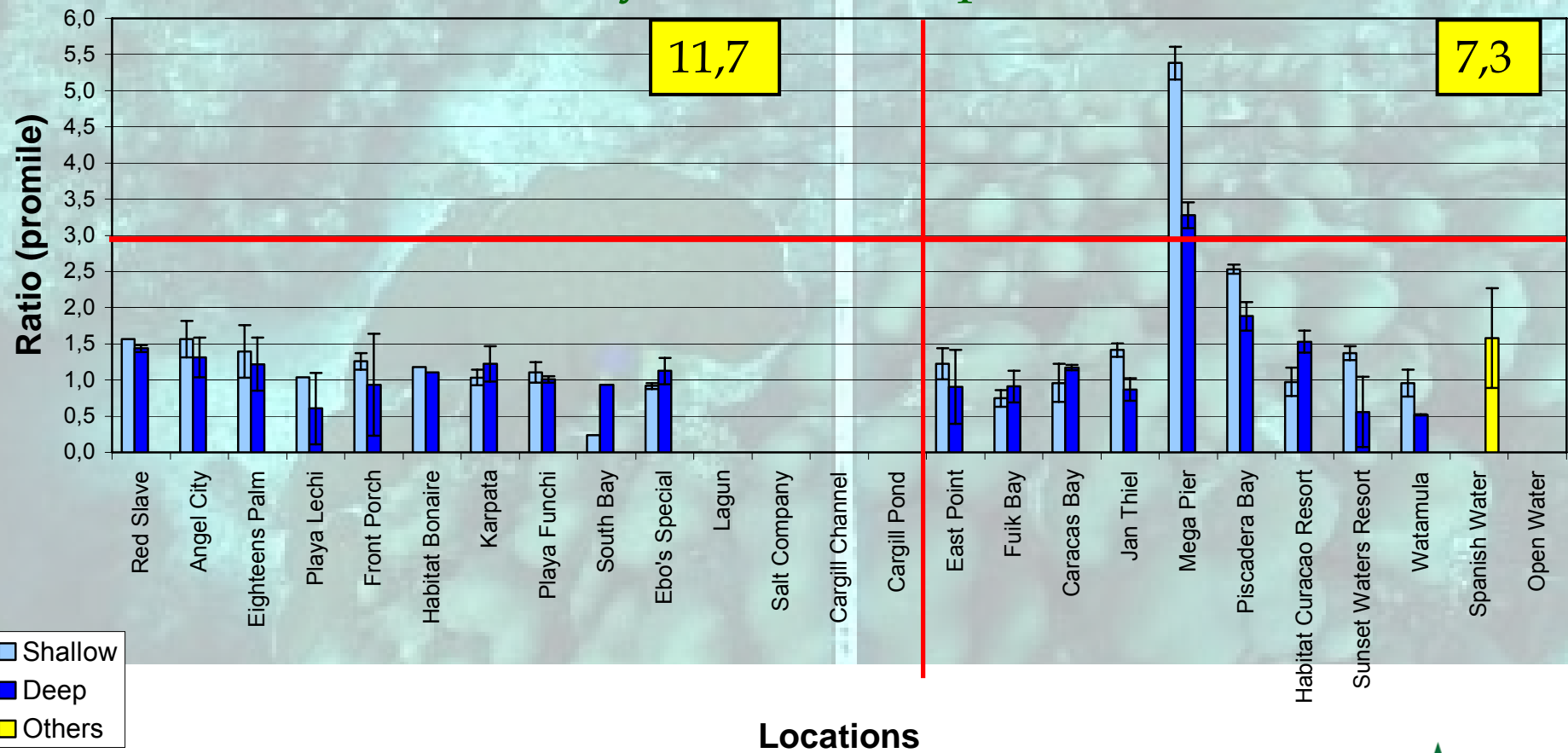
Nutrient Monitoring Program



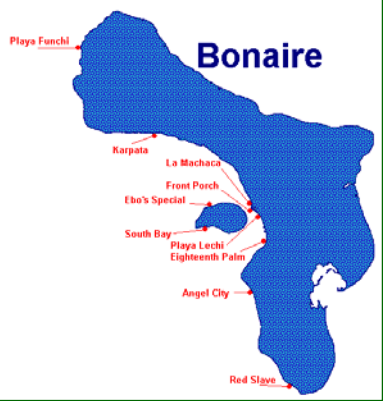
Results of Isotope Ratio $^{15}\text{N}/^{14}\text{N}$



Tukey Test: 4 Groups



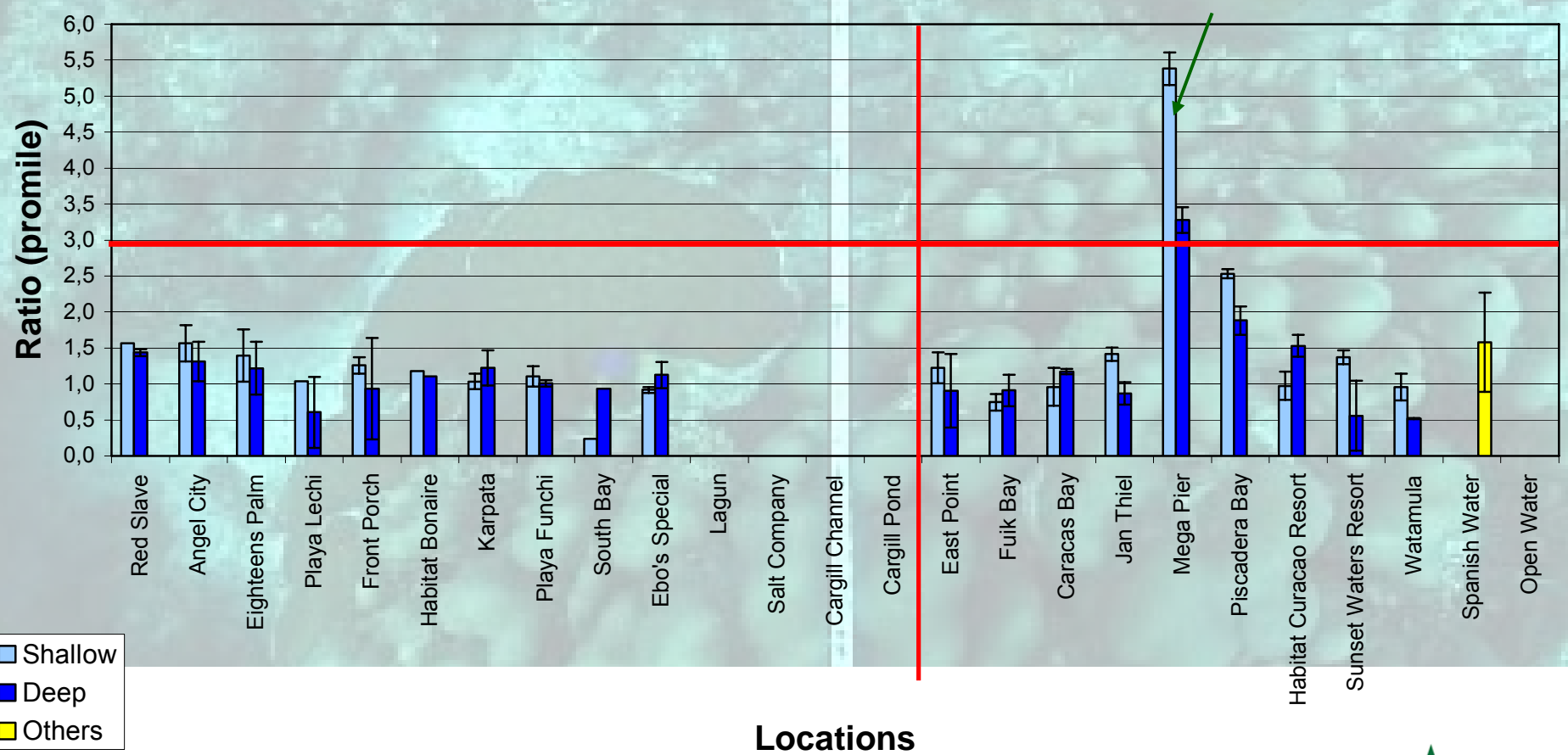
Nutrient Monitoring Program



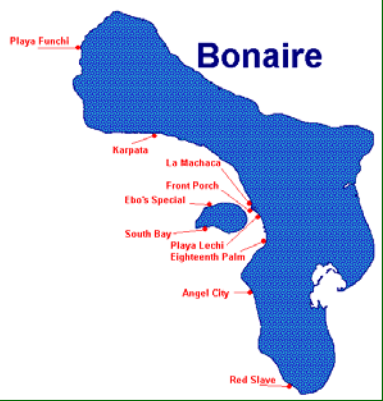
Results of Isotope Ratio $^{15}\text{N}/^{14}\text{N}$



Group 4



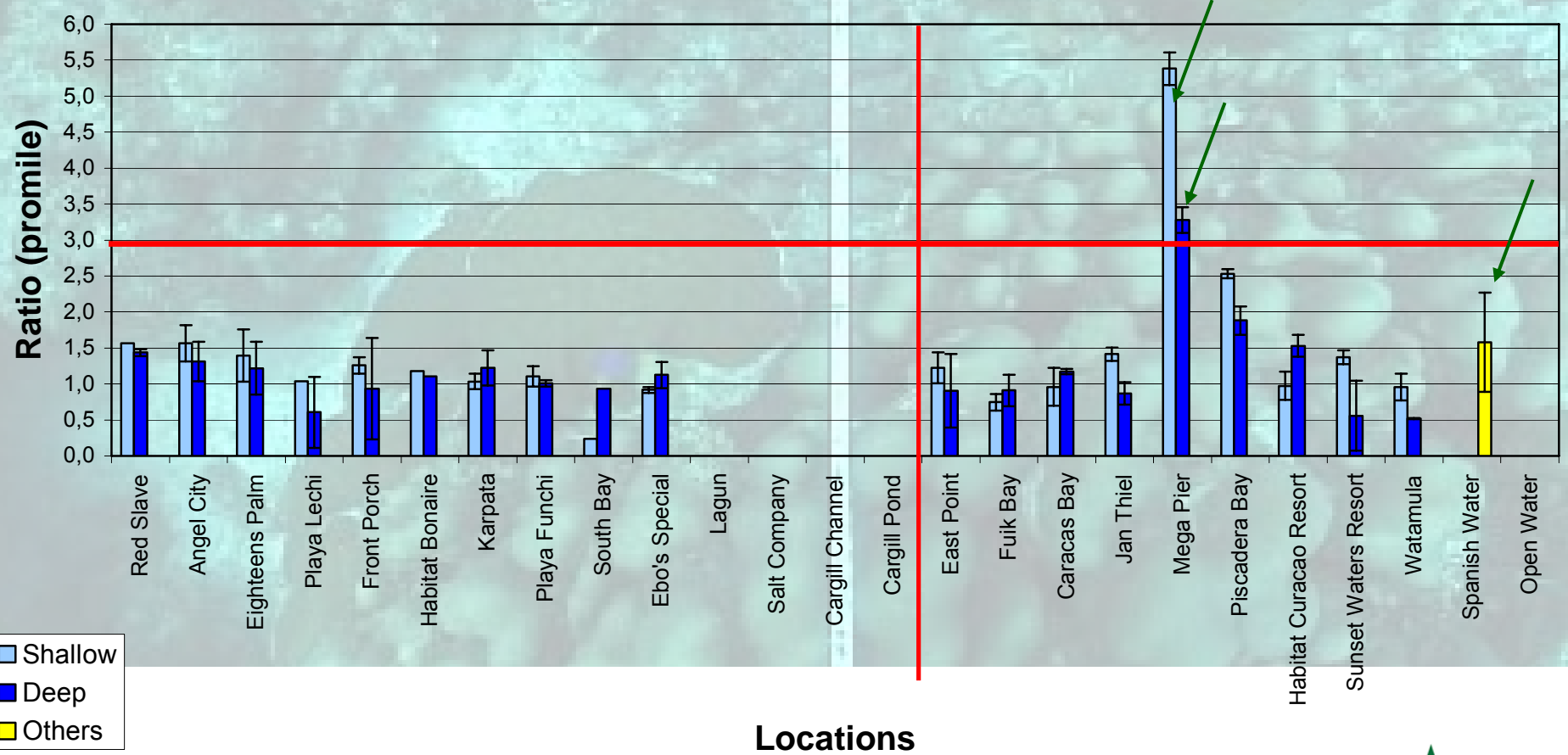
Nutrient Monitoring Program



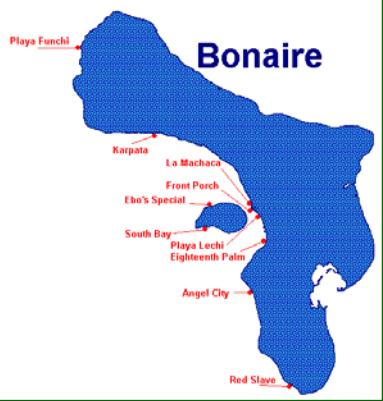
Results of Isotope Ratio $^{15}\text{N}/^{14}\text{N}$



Group 3

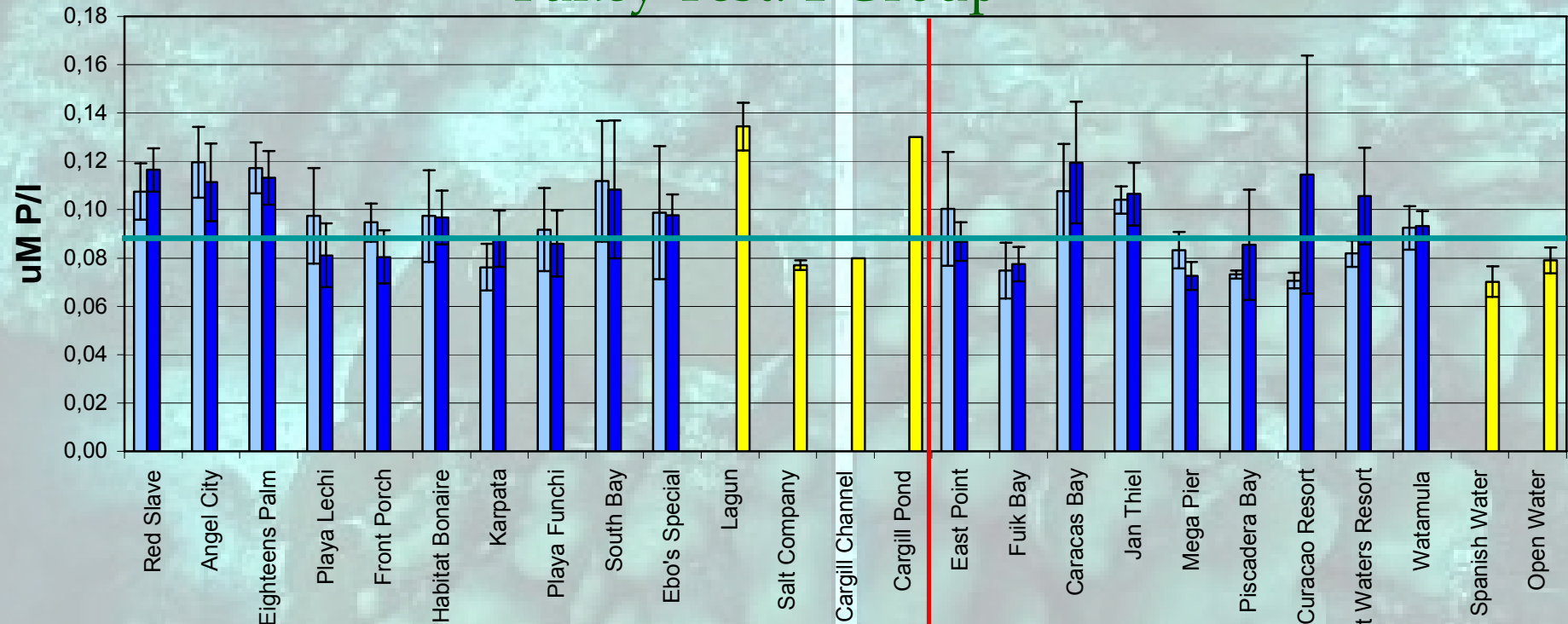


Nutrient Monitoring Program



Results of PO₄

Tukey Test: 1 Group



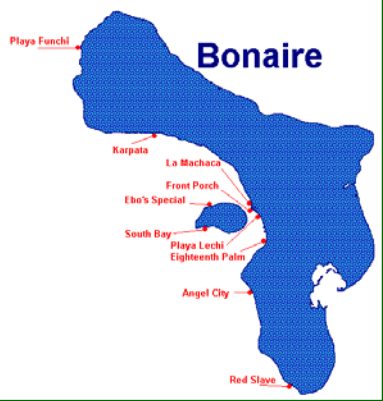
- Shallow
- Deep
- Others

St. Lucia: 0,09

Locations

Nutrient Monitoring Program

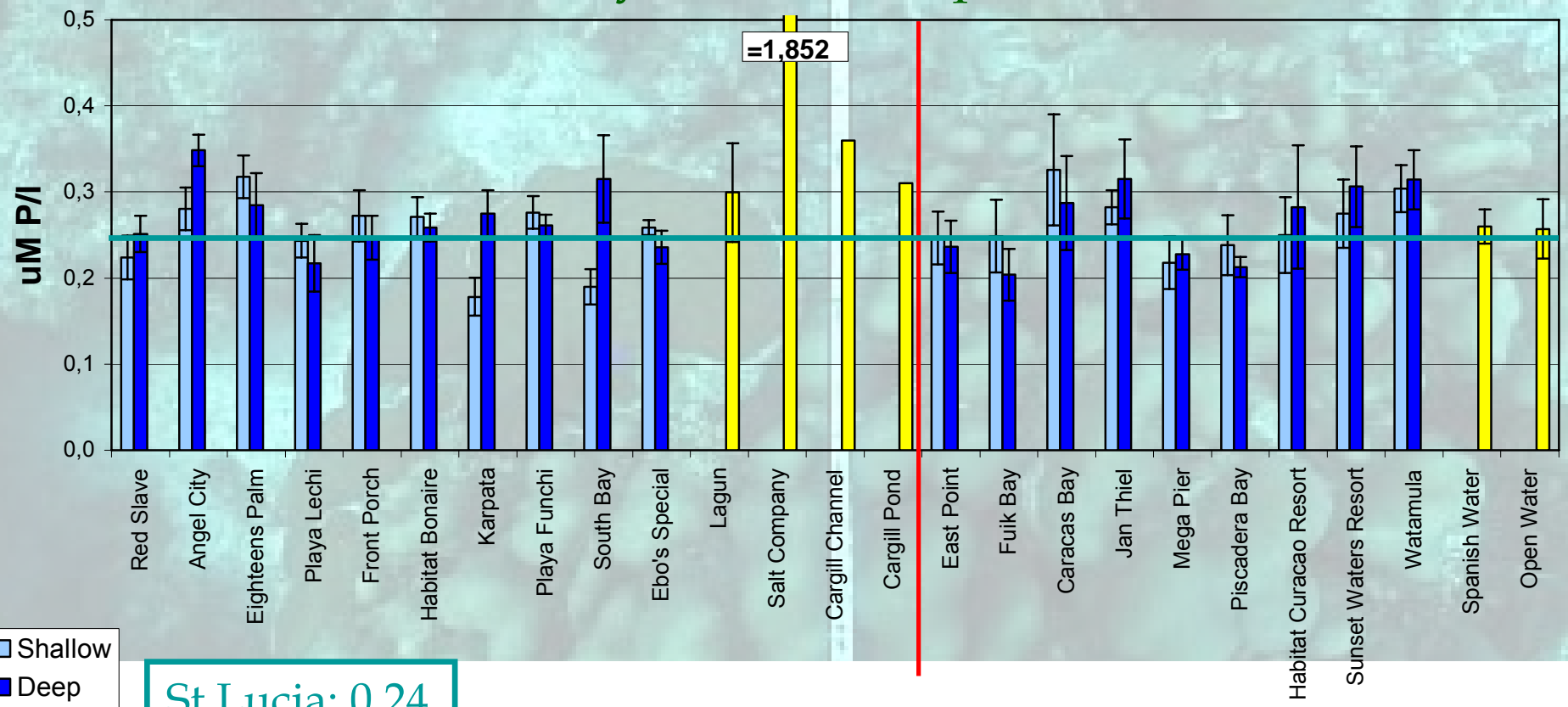




Results of TDP



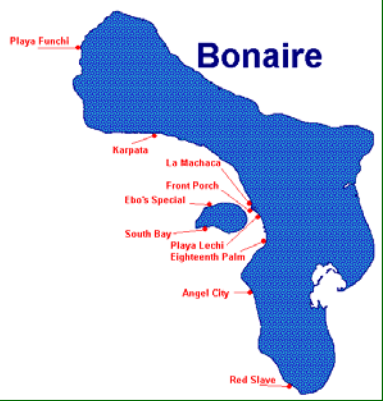
Tukey Test: 2 Groups



St. Lucia: 0,24

Locations

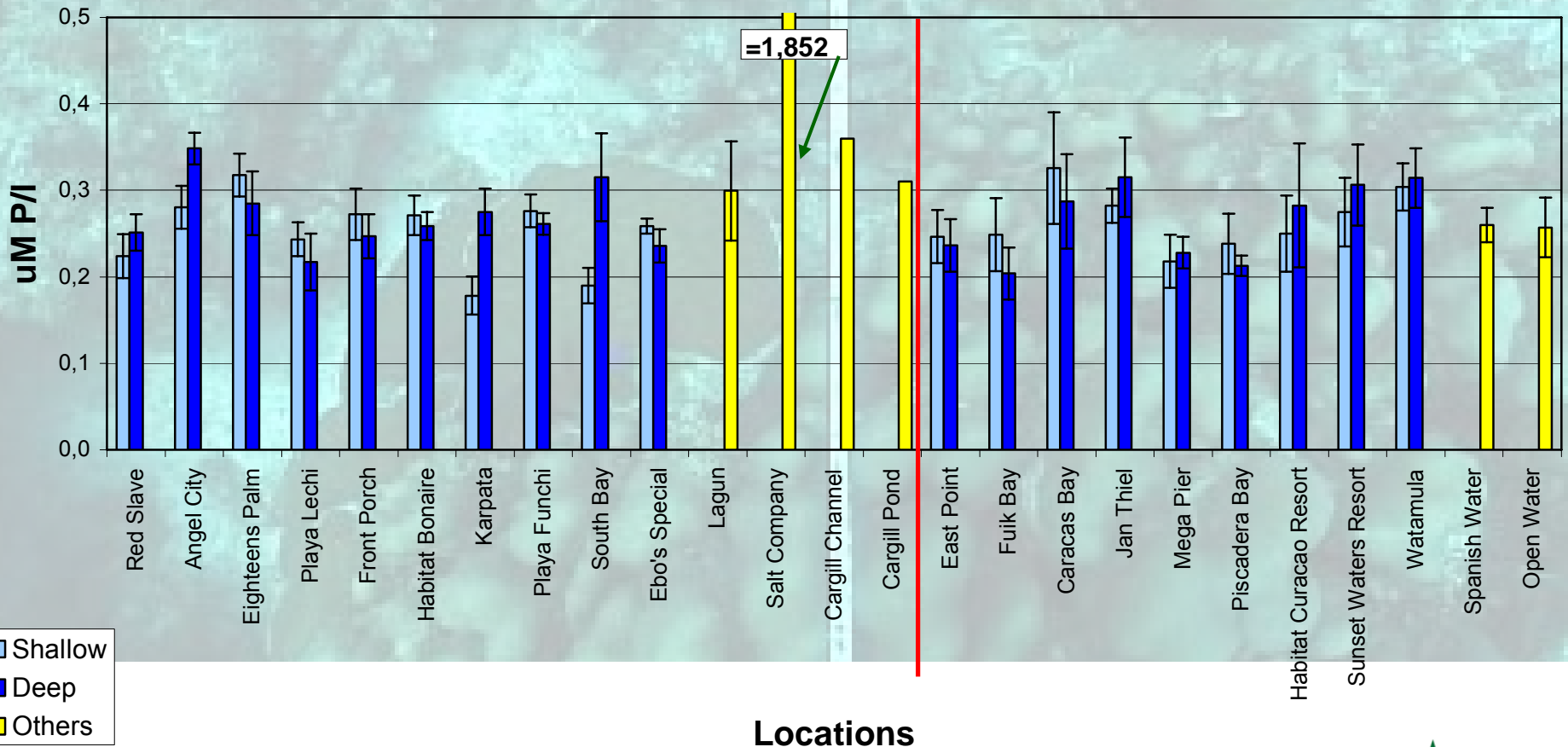
Nutrient Monitoring Program



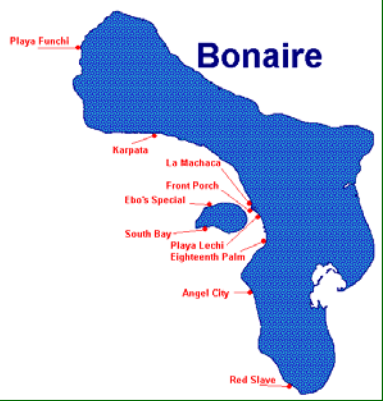
Results of TDP



Group 2



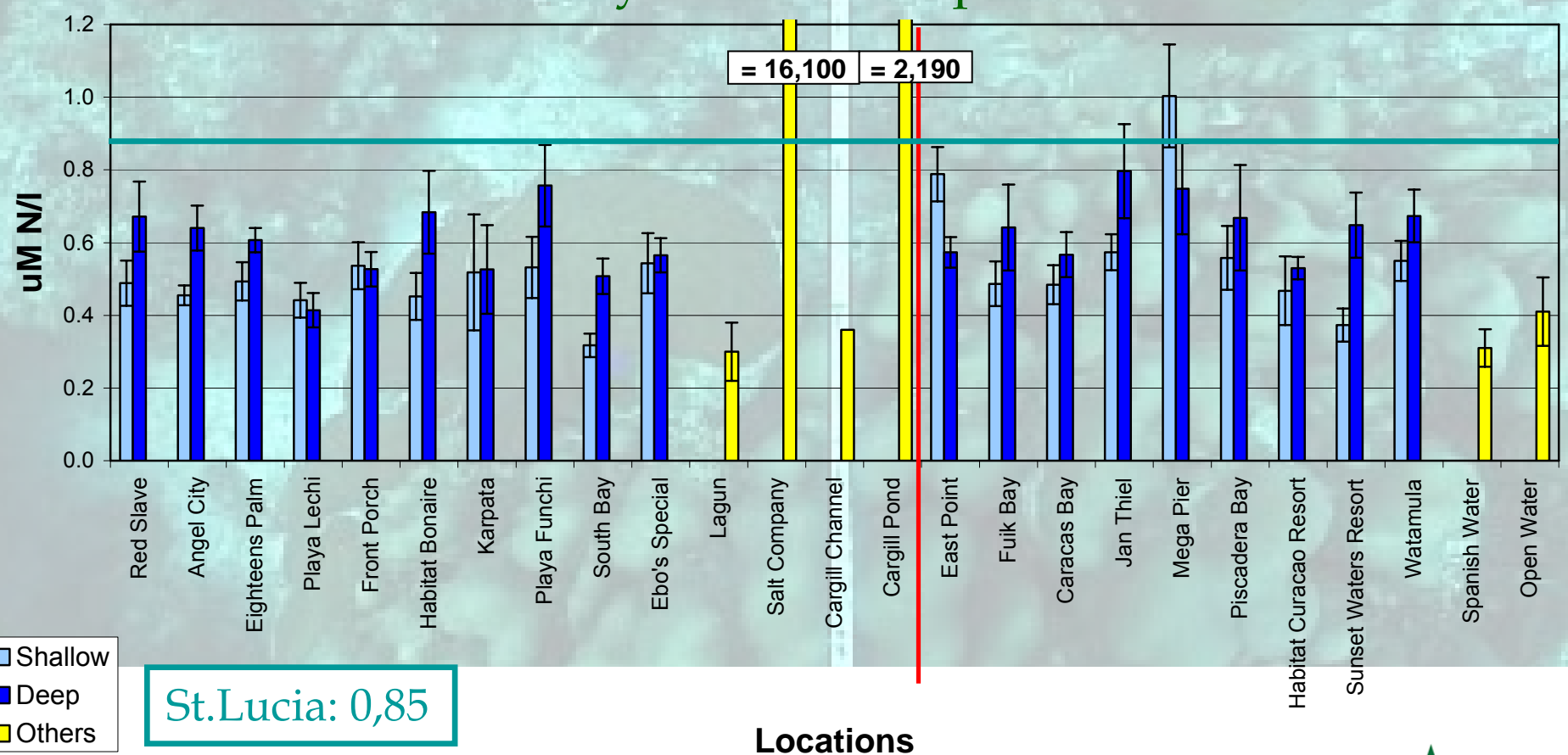
Nutrient Monitoring Program



Results of NO_2 plus NO_3



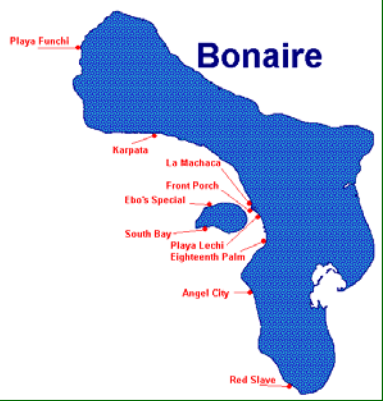
Tukey Test: 4 Groups



St. Lucia: 0,85

Locations

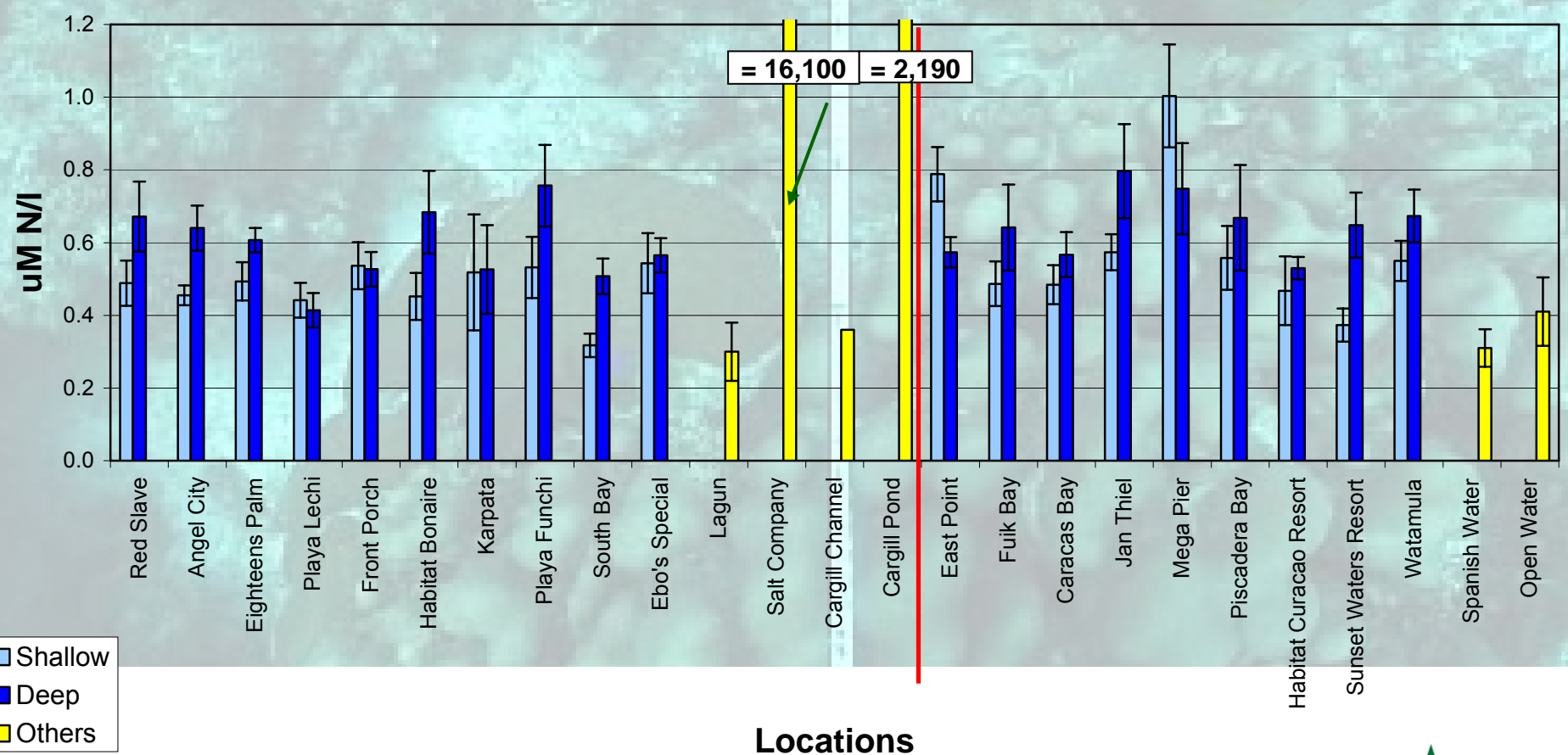
Nutrient Monitoring Program



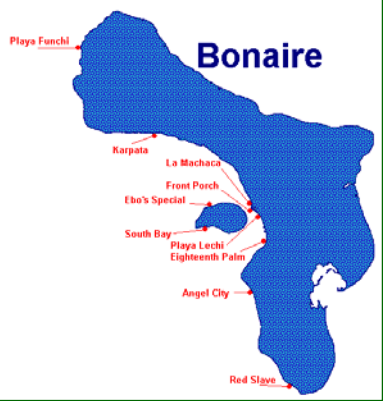
Results of NO₂ plus NO₃



Group 4



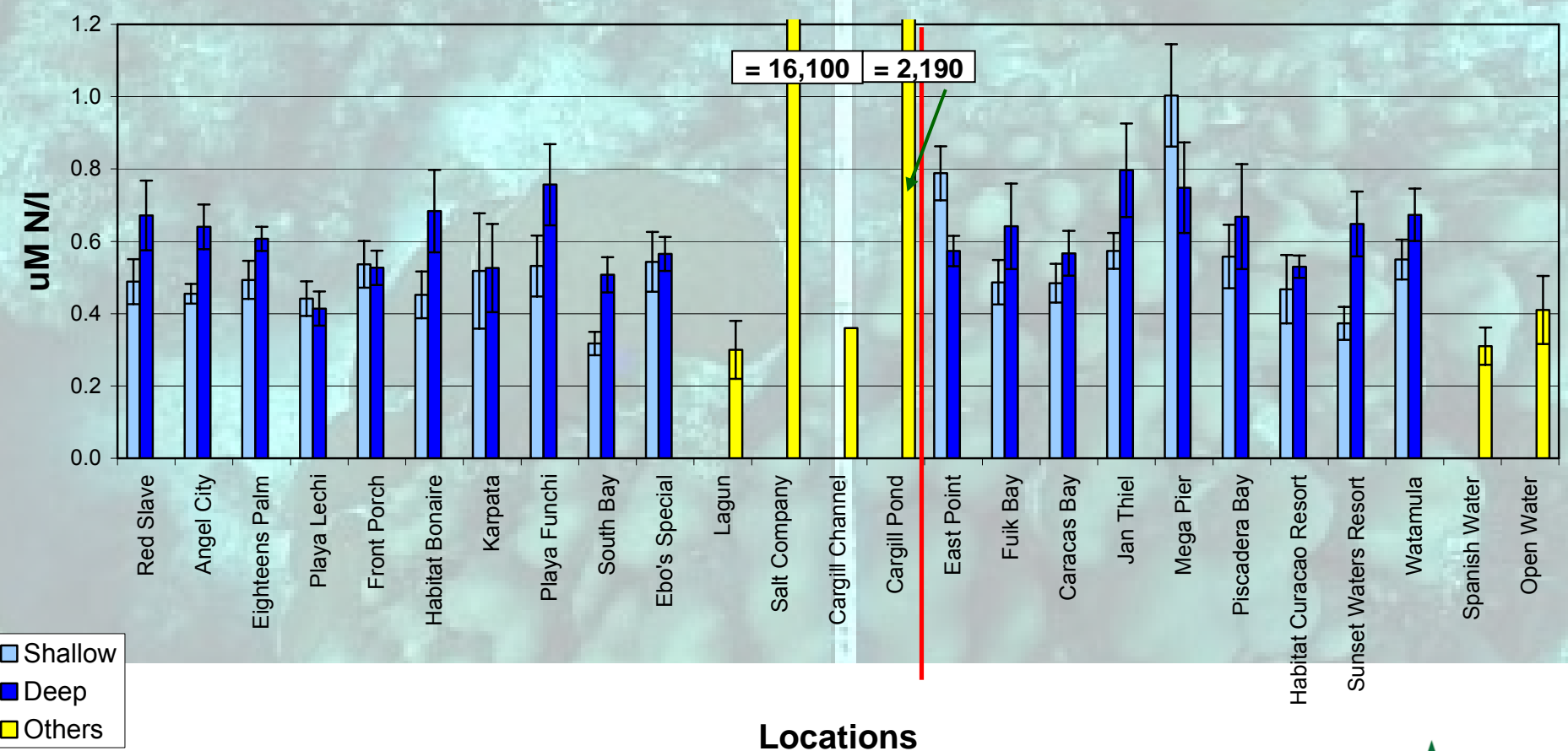
Nutrient Monitoring Program



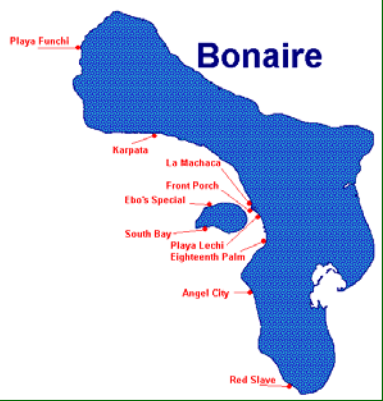
Results of NO₂ plus NO₃



Group 3



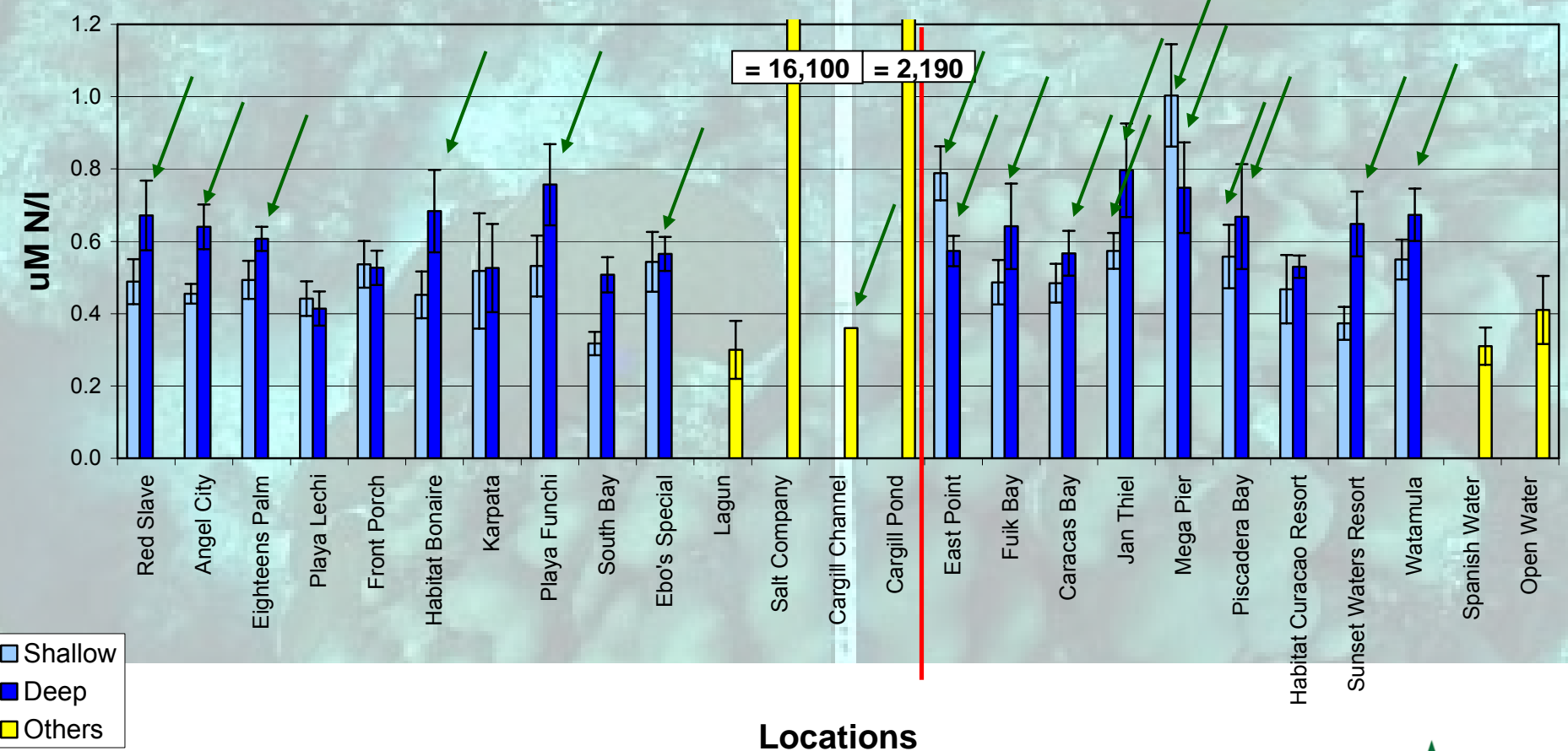
Nutrient Monitoring Program



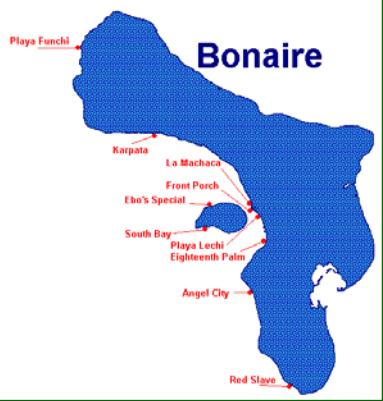
Results of NO₂ plus NO₃



Group 2



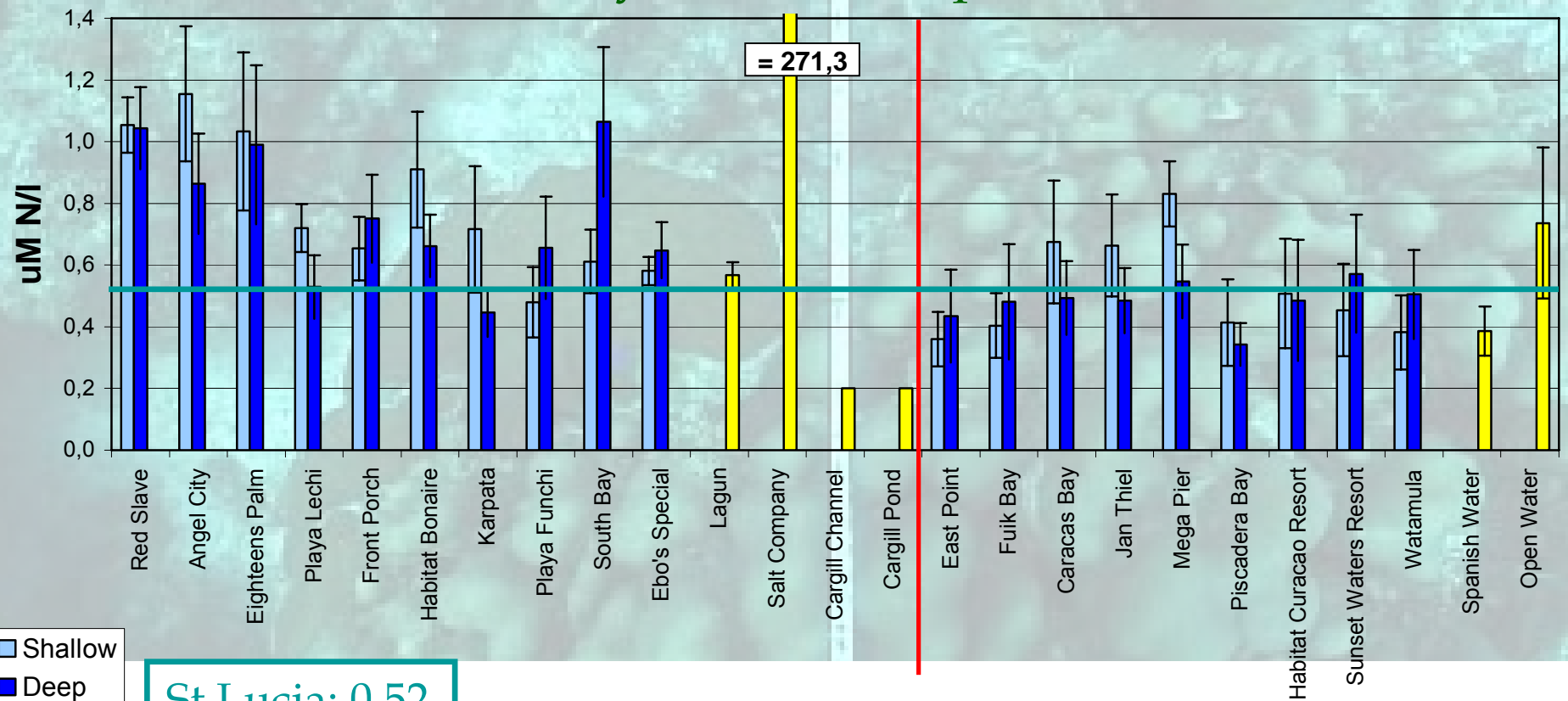
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Results of NH_4



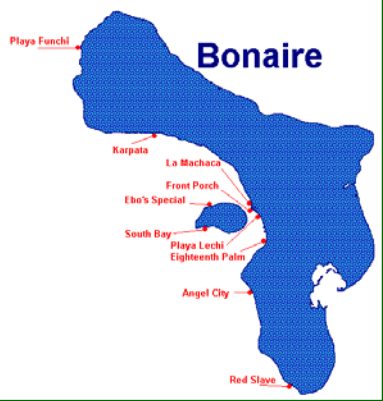
Tukey Test: 2 Groups



St. Lucia: 0,52

Locations

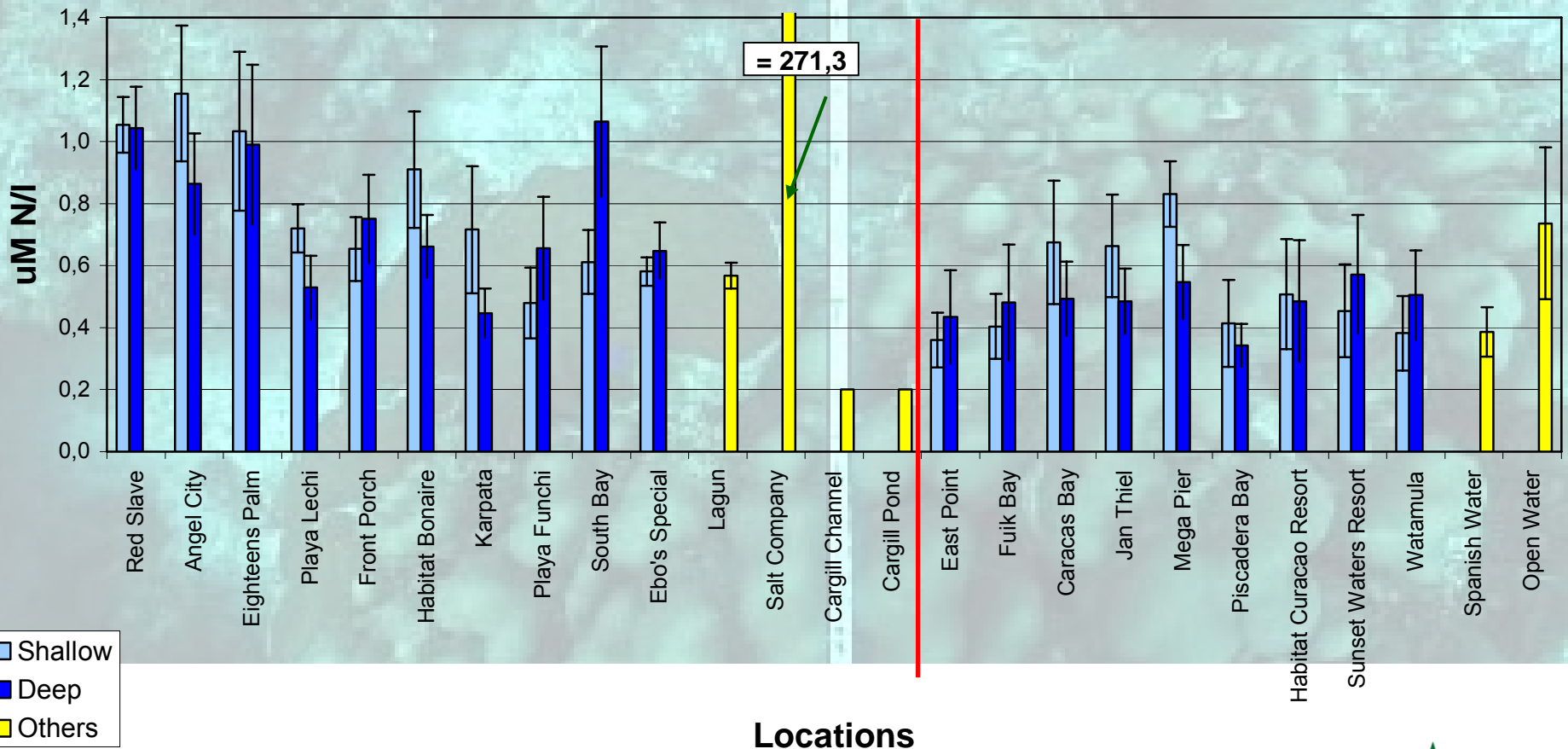
Nutrient Monitoring Program



Results of NH_4



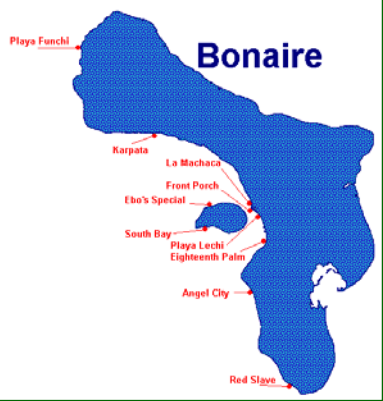
Group 2



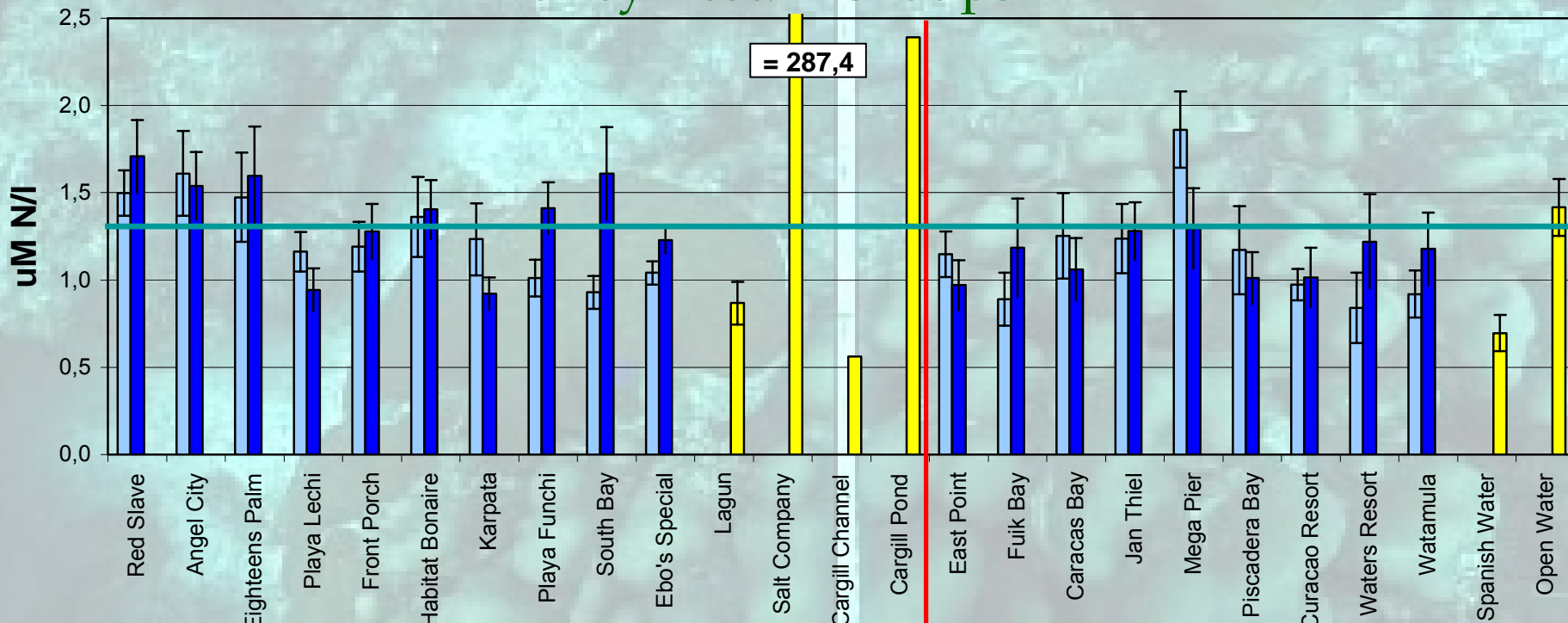
Locations

Nutrient Monitoring Program

Results of DIN



Tukey Test: 2 Groups

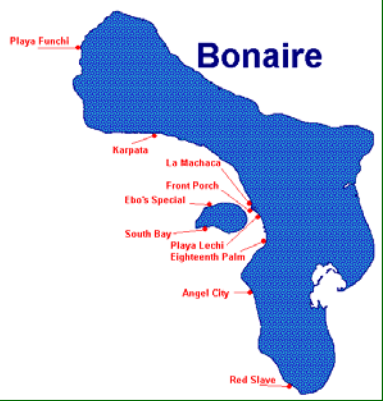


■ Shallow
■ Deep
■ Others

St. Lucia: 1,36

Locations

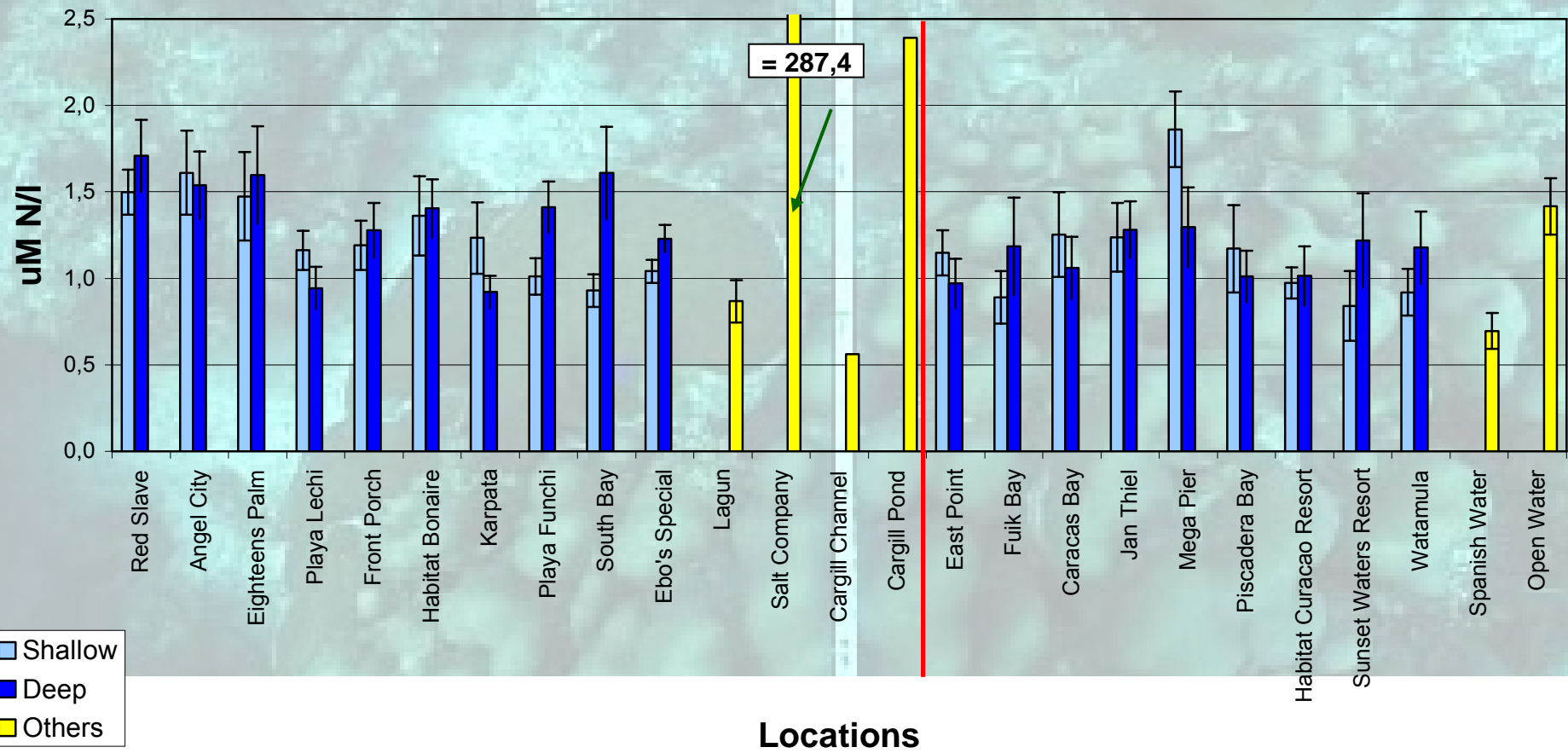
Nutrient Monitoring Program



Results of DIN



Group 2



Nutrient Monitoring Program

Conclusions

Salt Company Bonaire:

- High concentrations TDP and NH_4
- Quick nitrification of NH_4 to NO_x
- High outflow of NO_2 and /or NO_3
- Southern 3 sites highest concentrations PO_4 and NH_4 of all in Bonaire



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Conclusions

Curacao vs. Bonaire

- Higher macroalgae cover in Curacao (5 times more at shallow)
- Higher chlorophyll a concentrations in Curacao
- Three highest isotope ratios found on Curacao
- Higher NH_4 on Bonaire and higher NO_x on Curacao
- Reefs on Curacao appear to be more eutrophic

Conclusions

Chlorophyll α and Isotope Ratio $^{15}\text{N}/^{14}\text{N}$:

➤ Group of 4, possible 6, polluted sites

Mega Pier shallow

Mega Pier deep

Piscadera shallow

Spanish Water surface

Piscadera deep

Lagun surface

(outflow of landfill)

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Conclusions

- Both Bonaire and Curacao are at or just above the nutrient thresholds for eutrophication of coral reefs
- Higher chlorophyll a and macroalgae cover on Curacao suggests higher land-based nutrient loads.
- Higher macro-/turf algae ratio may reflect higher grazing in Bonaire
- Continued long-term monitoring is of great importance for the future of our coral reefs.

CONCLUSIONS

Bonaire's present situation is between the borders of healthy and polluted, careful policy and management are required.

Curacao's present situation is a little worse. Several sites like Mega Pier and Piscadera Bay are obvious polluted and passed the borders indicating a polluted reef.

Any Questions?



Thanks to:
All the volunteers
STINAPA
SMMA
Dr. Brian Lapointe
NOAA-NFWF
WW2BW-NMSF
UNEP-CEP
SPA W

Nutrient Monitoring Program

