Contamination of Caribbean Coastal Waters by the Antifouling Herbicide Irgarol 1051®

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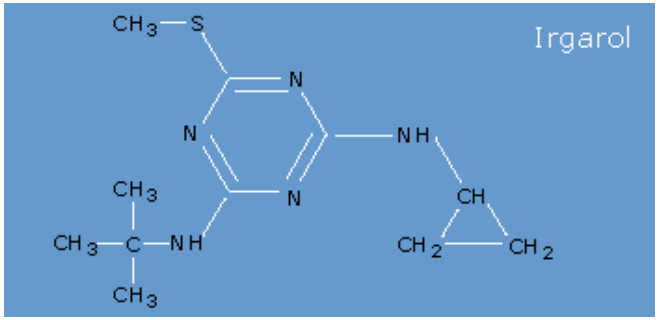
- Background
- Published Results
- Spatial and Temporal Variation Studies
- On-Going Work: Chronic Effects on Corals
- Conclusions

- Organotin compounds banned as additive to antifouling paints in recreational boats (2003 and phased-out completely in 2008).

- Irgarol 1051, a potent s-triazine additive of antifouling paints, introduced in the 90´s for recreational boats.



Incidence of Contamination

- Europe, Japan, United States, Singapore, Australia and Bermuda
  - Concentration range: 61-2,218ng l-1 in 38 locations worlwide

- Limited Information in Caribbean Waters

Environmental Considerations

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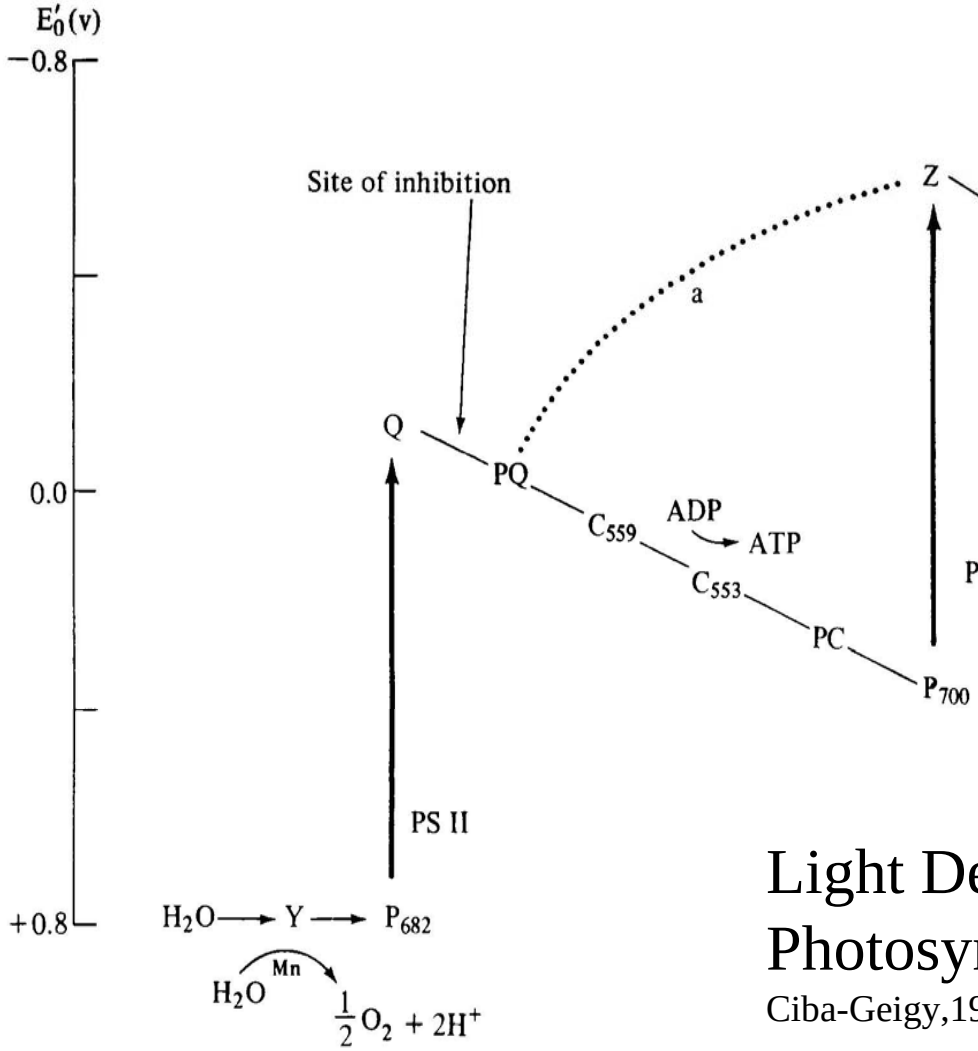
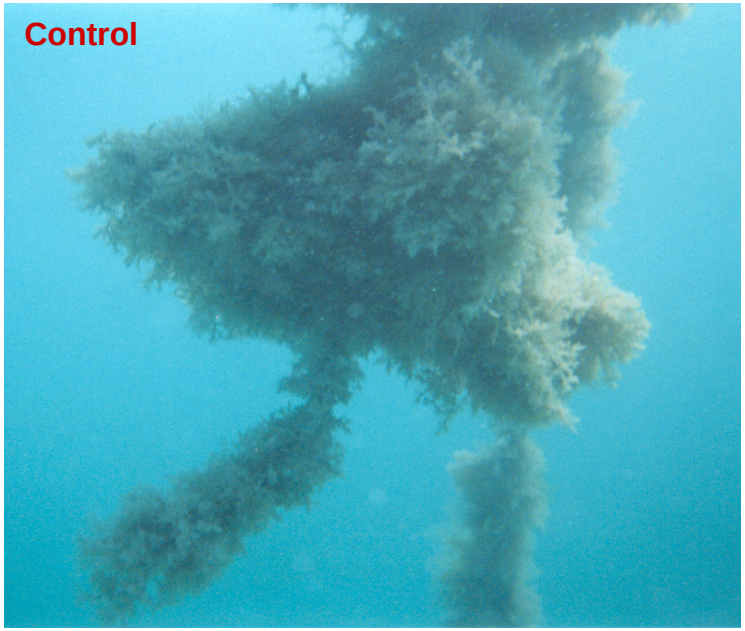


Light Dependent Reactions
Photosynthesis
Ciba-Geigy,1991

Example

- Ten week exposure to fouling of Irgarol treated and control nets.

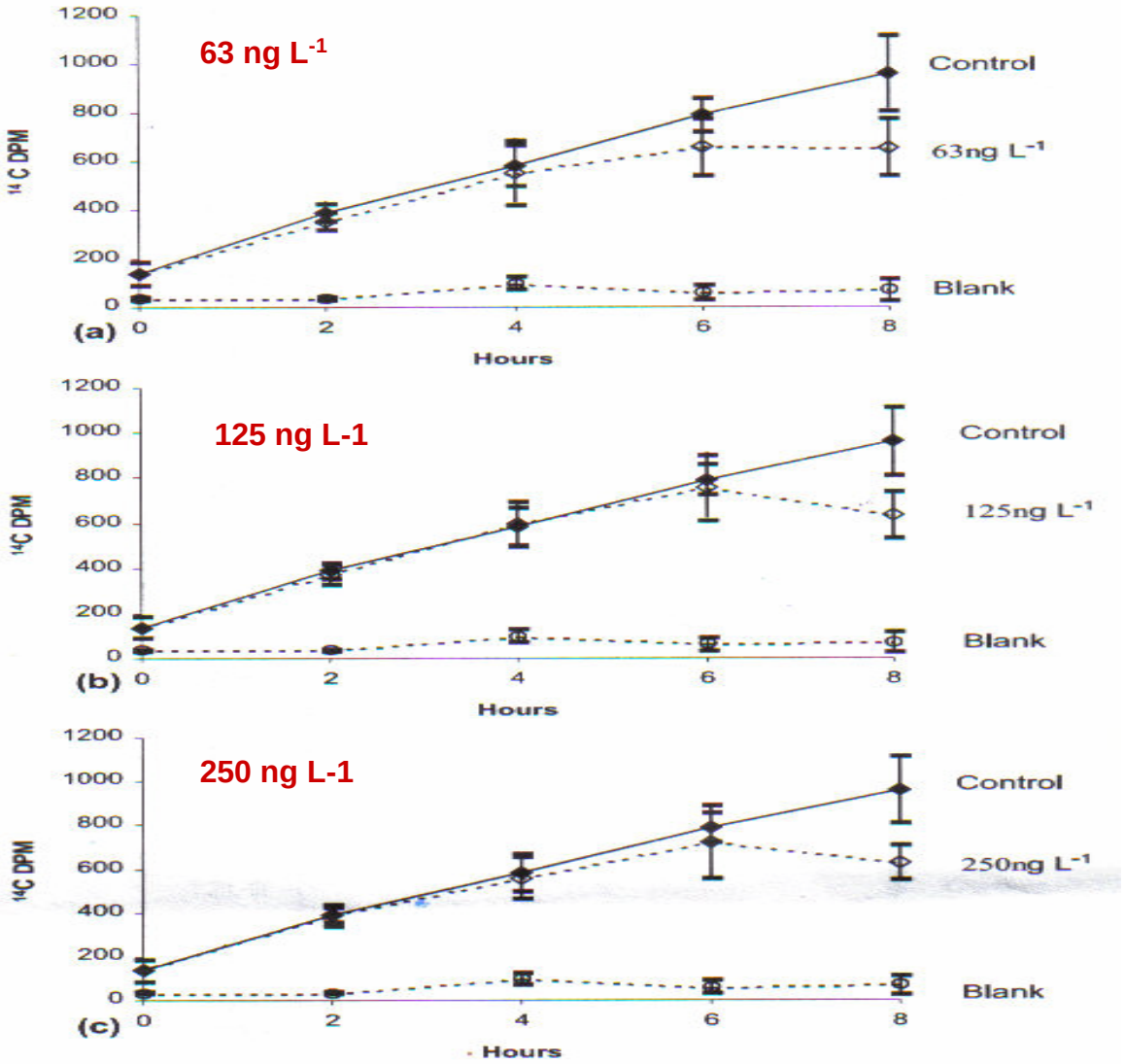


Environmental Considerations

- Mode of Action
- Concentration dependent
- Removal by dilution, biodegradation, photolysis, chemical hydrolysis, sorption/sedimentation, volatilization and bioconcentration.
- Effects on phytoplankton, algae, seagrasses and coral associated symbionts and coral.

Incorporation of 14C by isolated coral zooxanthellae

(Owen et al. 2002)



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Study Sites and Results

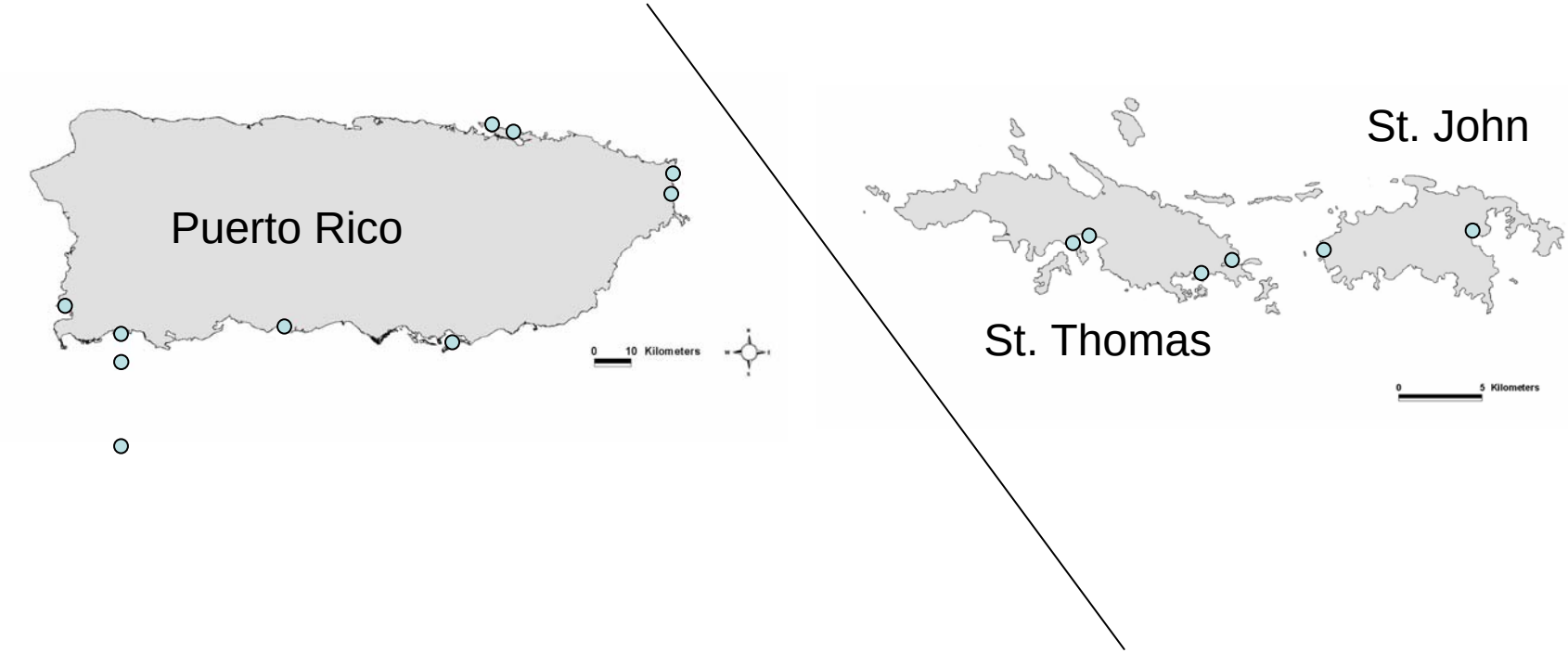
Marina del Rey, Fajardo, PR

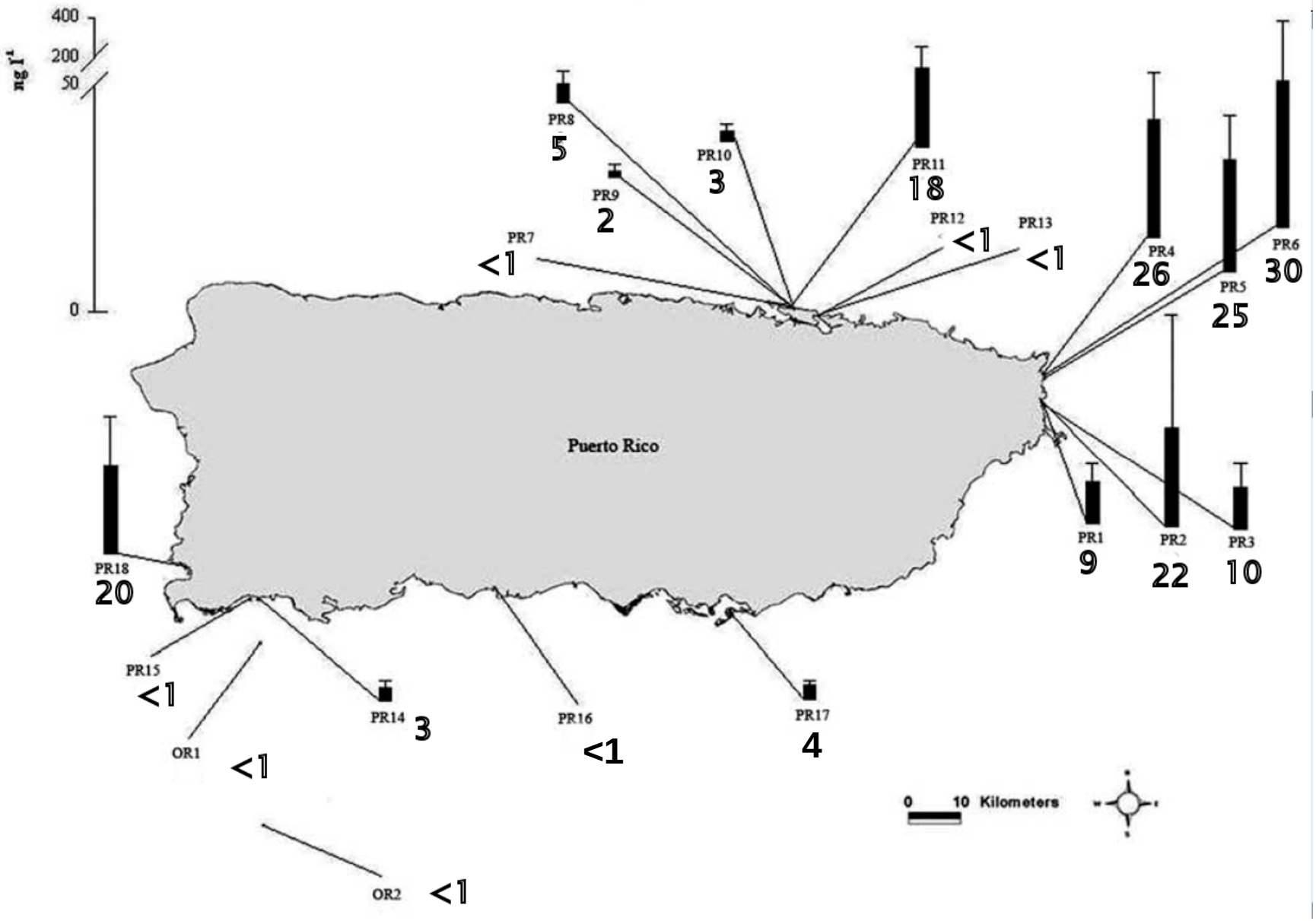
Benner Bay, St. Thomas, USVI

American Yatch Harbour, St. Thomas, USVI

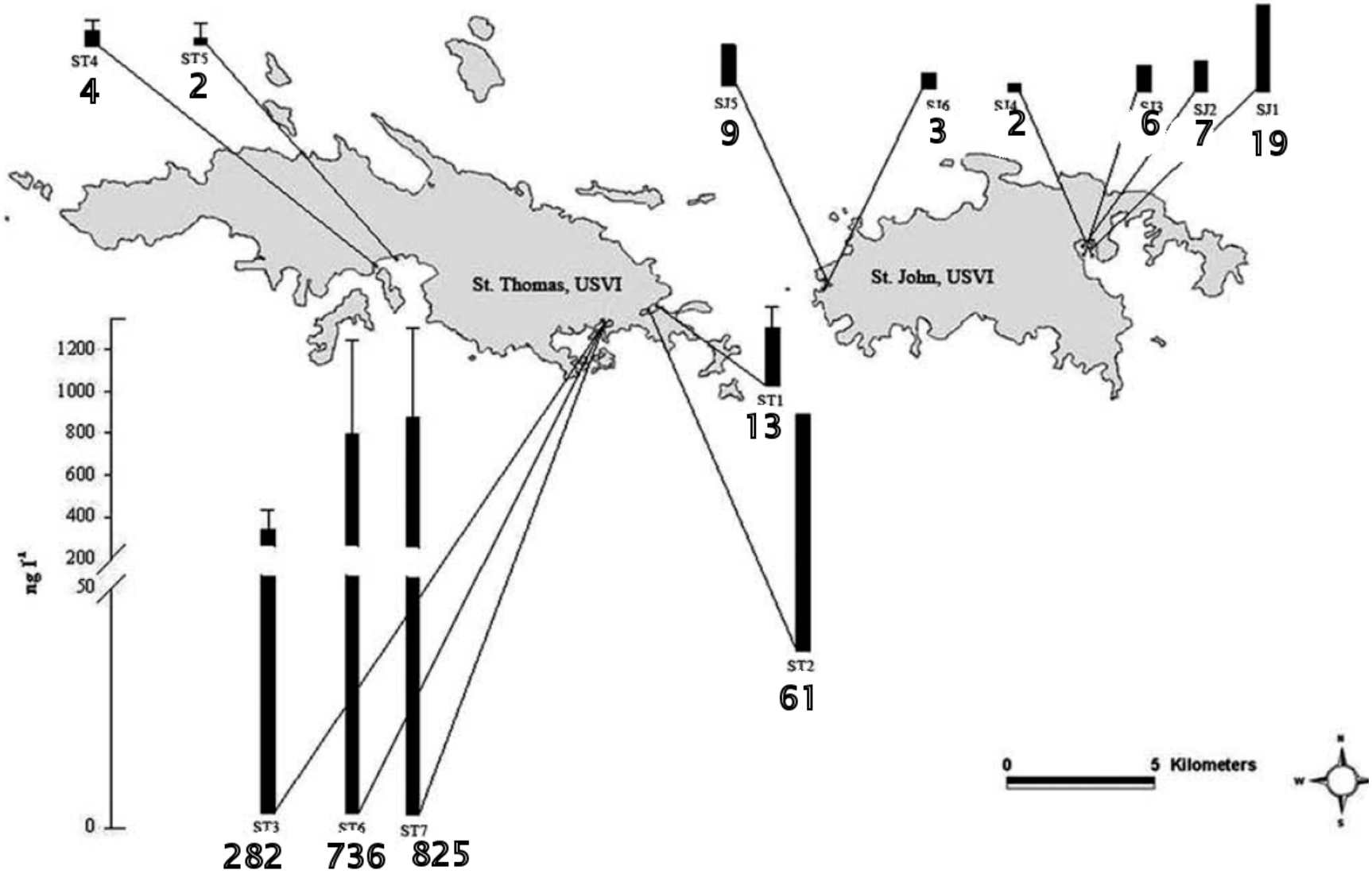
Club Náutico, La Parguera, PR

Sampling Areas



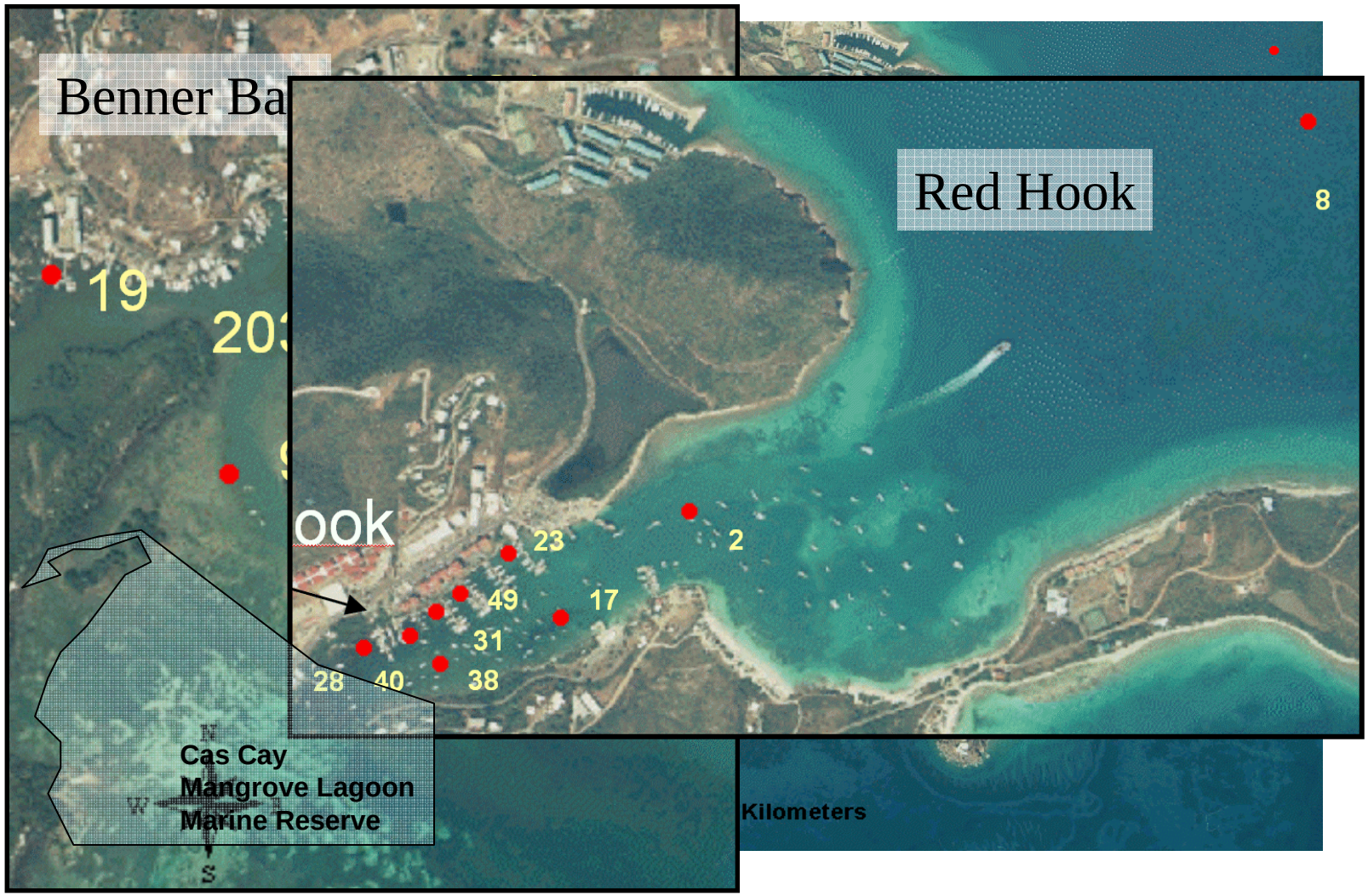


Carbery, Owen, Frickers, Otero, Readman, 2005. MPB

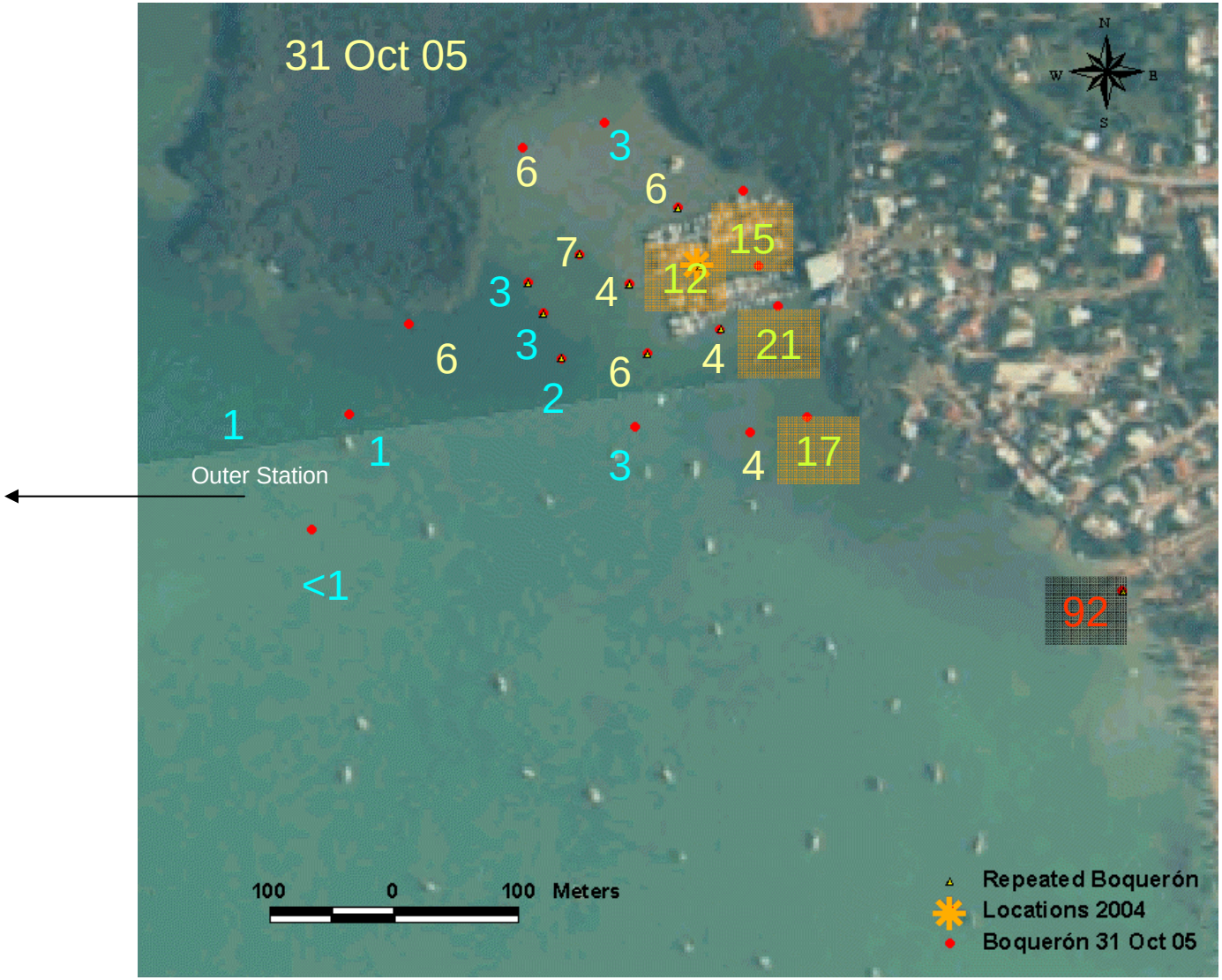


Carbery, Owen, Frickers, Otero, Readman, 2005. MPB

Spatial Distribution of Irgarol: St. Thomas



Boquerón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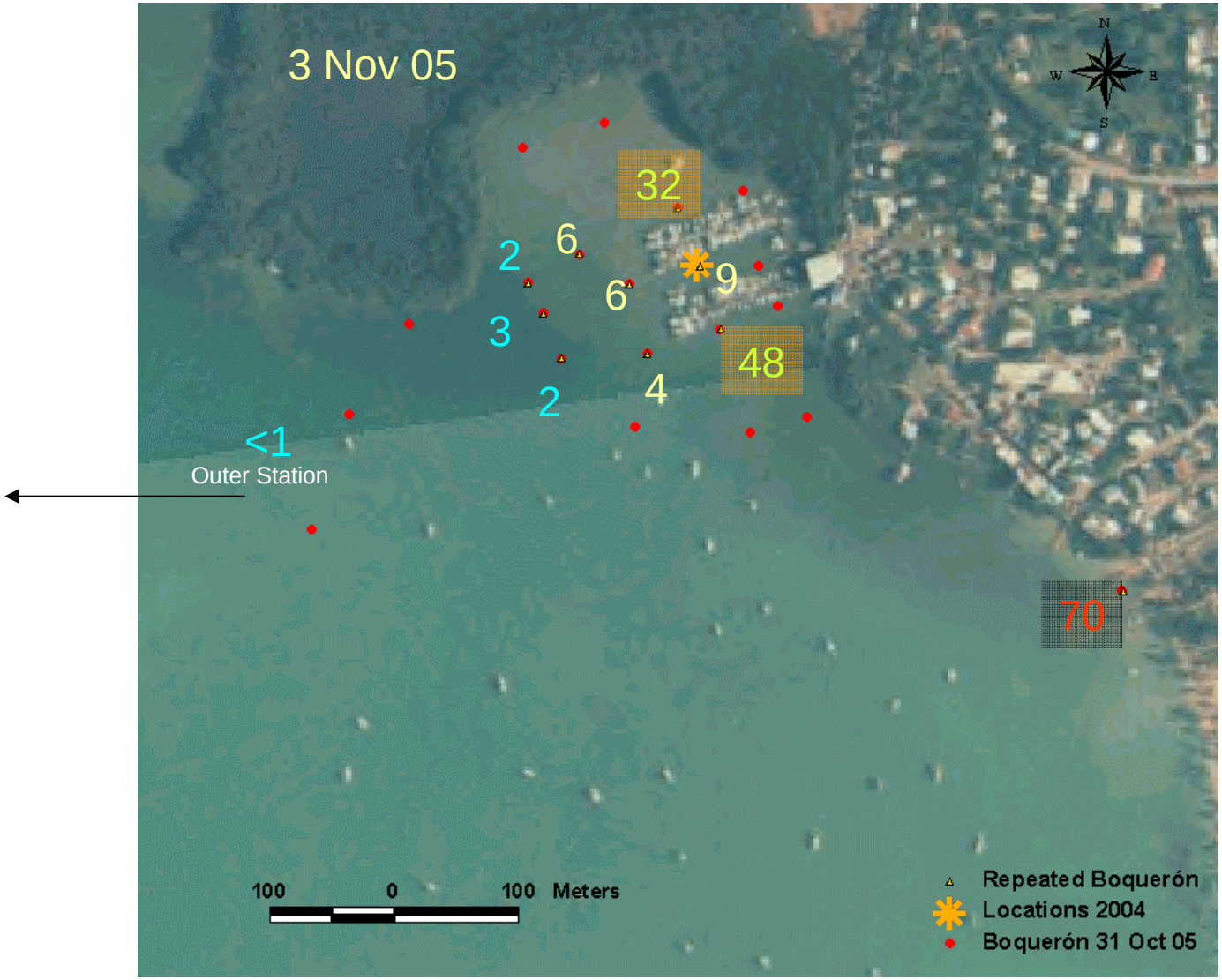
Repeated Boquerón Locations 2004
Boquerón 31 Oct 05

Boquerón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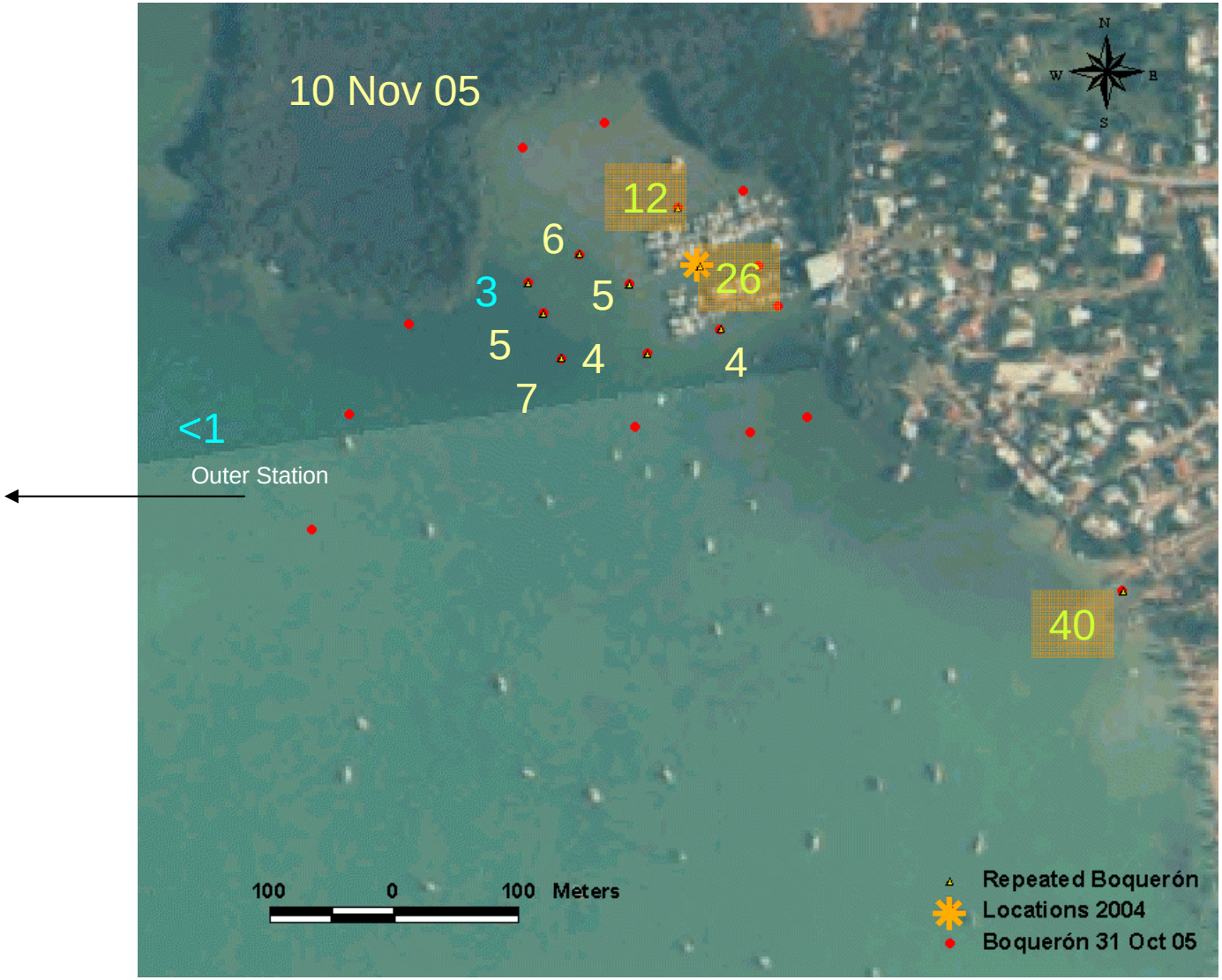
Repeated Boquerón Locations 2004
Boquerón 31 Oct 05

Boquerón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Repeated Boquerón Locations 2004
Boquerón 31 Oct 05

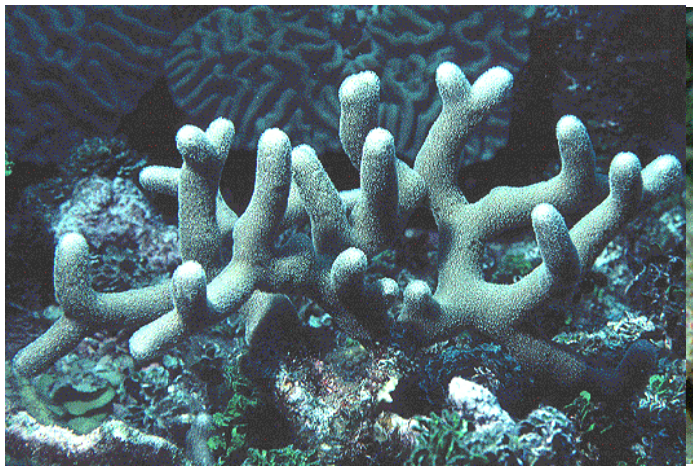
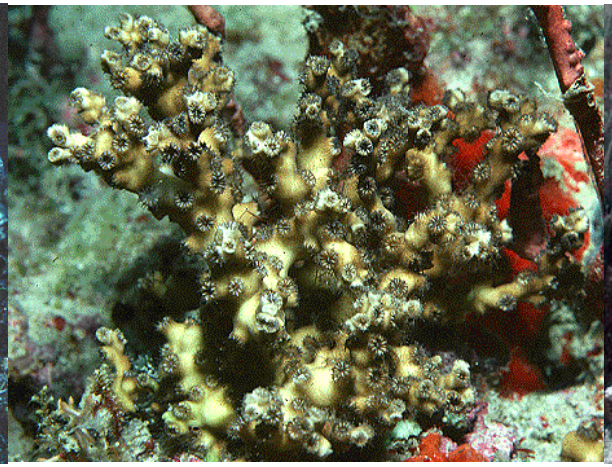
Impact of Low-Level Contamination of Irgarol on Coral Growth

In situ exposure of coral transplants to small amounts of Irgarol-containing antifoulant paints for two months (Oct-Dec 06)

Exposure to low dosages of Irgarol in wet tables (5, 10, 20, 50, 100 ng/l) for 2 months (Oct-Dec 06)

Assessment of coral growth and survival

Porites sp. and *Occulina* sp. Maybe *Acropora cervicornis*.

Conclusions

- Irgarol 1051 concentration in Puerto Rico is lower than in St. Thomas probably due to location specific characteristics and access to antifoulant products.

- High level Irgarol Contamination was confirmed in Benner Bay, St. Thomas which would significantly affect benthic biota (Accute Effects)

Conclusions, continued

- The time series at Boquerón confirmed previous data and suggests that Irgarol contamination in the area is fairly stable.

- Also, significant levels were found associated to the entrance of an inland Marina

Conclusions, continued

- Significant long-term effects of intermediate level contamination is uncertain but important to ascertain.

- Long term studies are critical to link the above observations with specific effects on benthic biota, including those protected by ESA and Fisheries Regulations.