



# Invasive Lionfish in Barbados

Hazel A. Oxenford

University of the West Indies,  
Cave Hill, Barbados



Lionfish & Sea Cucumber Workshop  
Havana, Cuba  
29-30 April, 2014





## Progression of lionfish invasion



Pioneer population  
 escaped from aquaria  
 in mid 1980s -1990s  
 In Florida, USA





# Progression of lionfish invasion





## Progression of lionfish invasion





## Progression of lionfish invasion





## Progression of lionfish invasion





# Progression of lionfish invasion





# Progression of lionfish invasion







# Progression of lionfish invasion





## Progression of lionfish invasion





## Progression of lionfish invasion





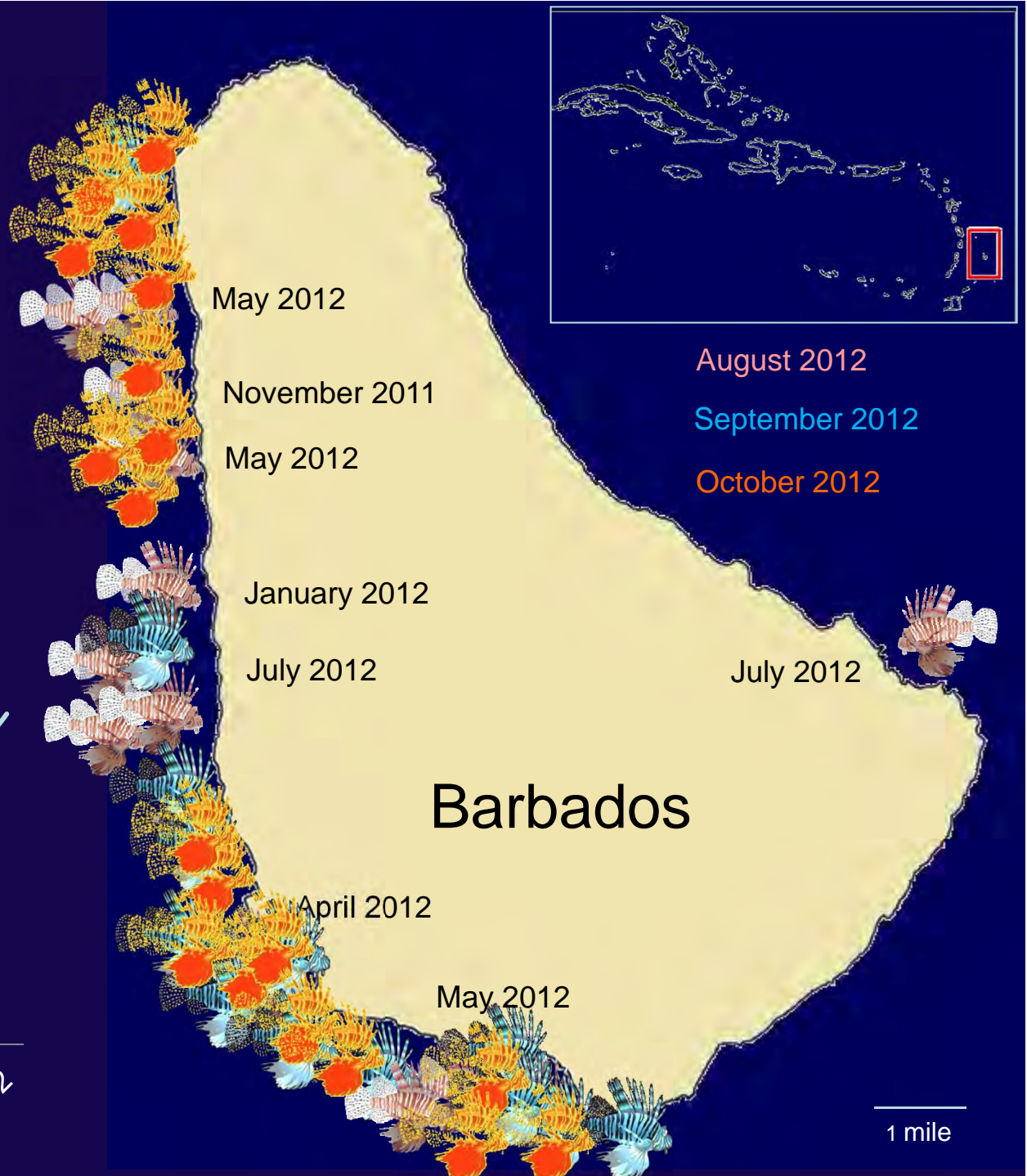
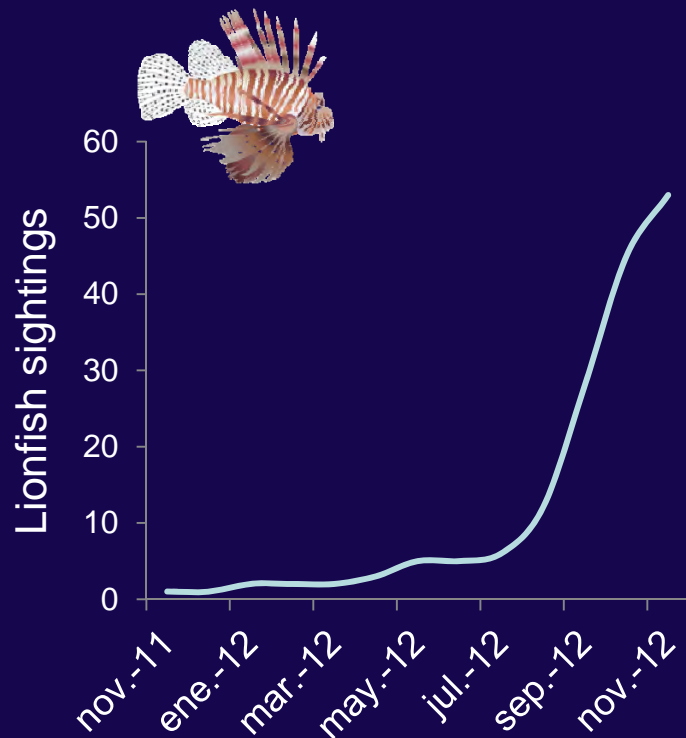
2012



Progression of  
lionfish  
invasion

# Invasion chronology Year 1

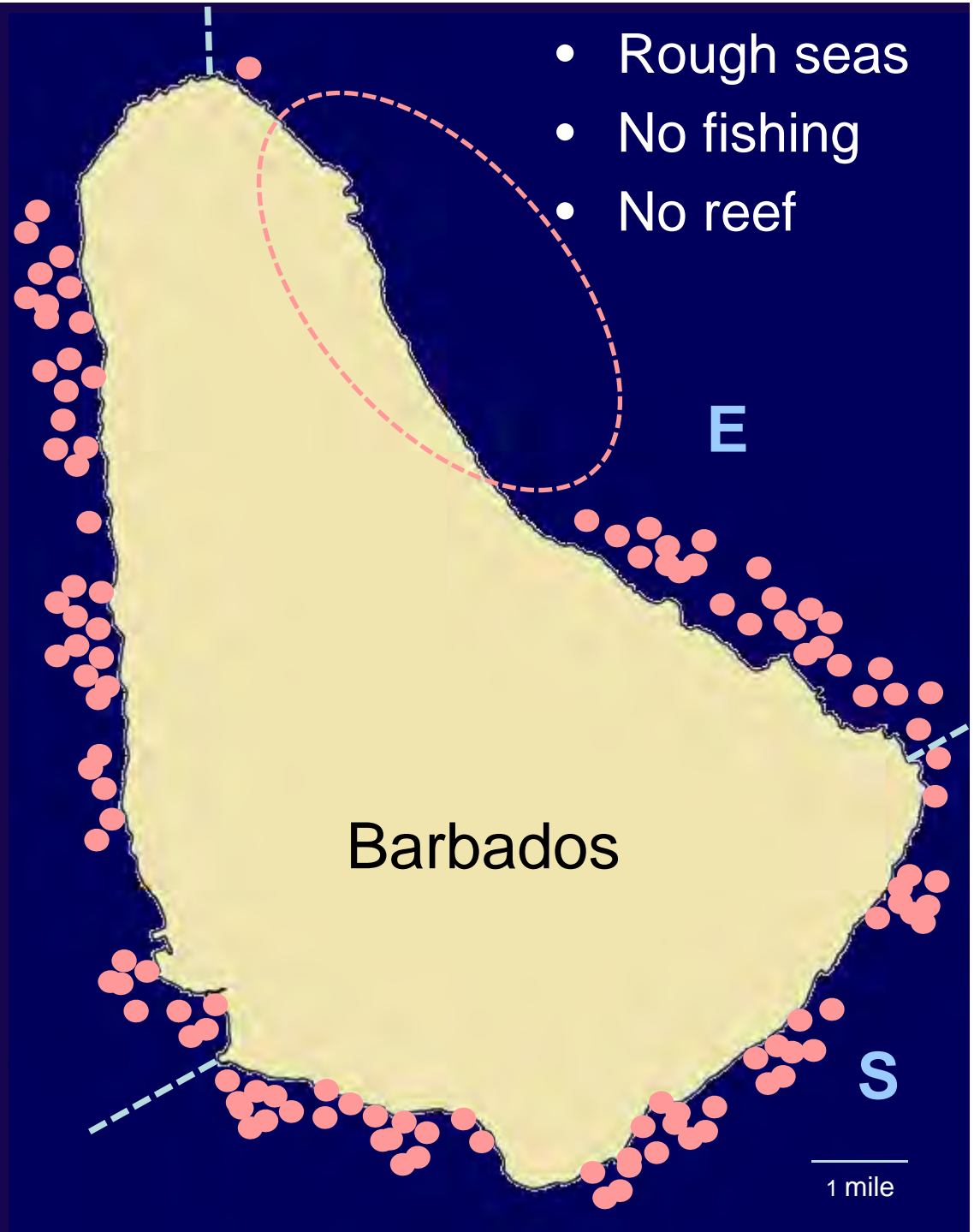
54 confirmed sightings in first year  
Nov 2011-2012



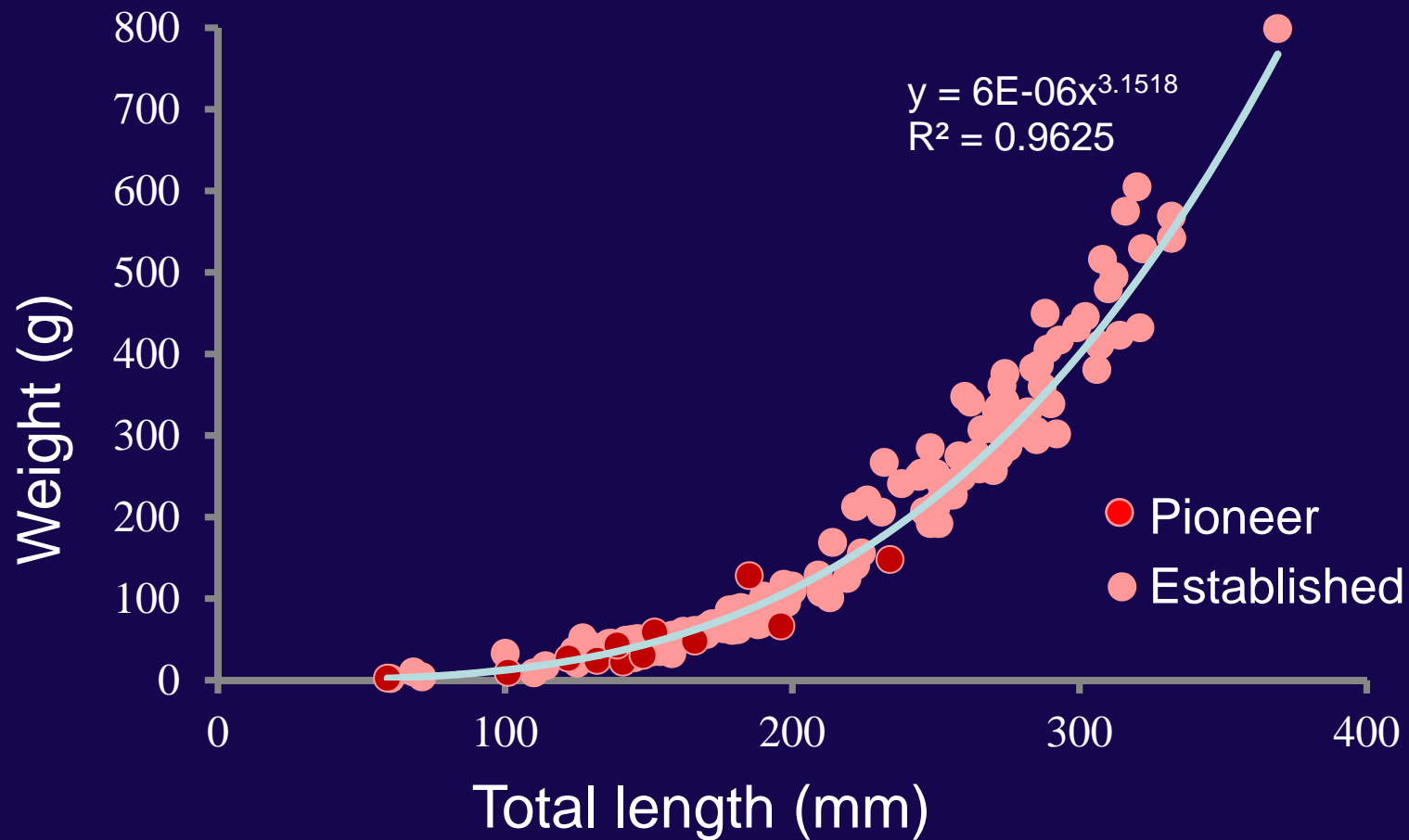
# Distribution of samples Year 2



W



# Biological characteristics: length-weight relationship



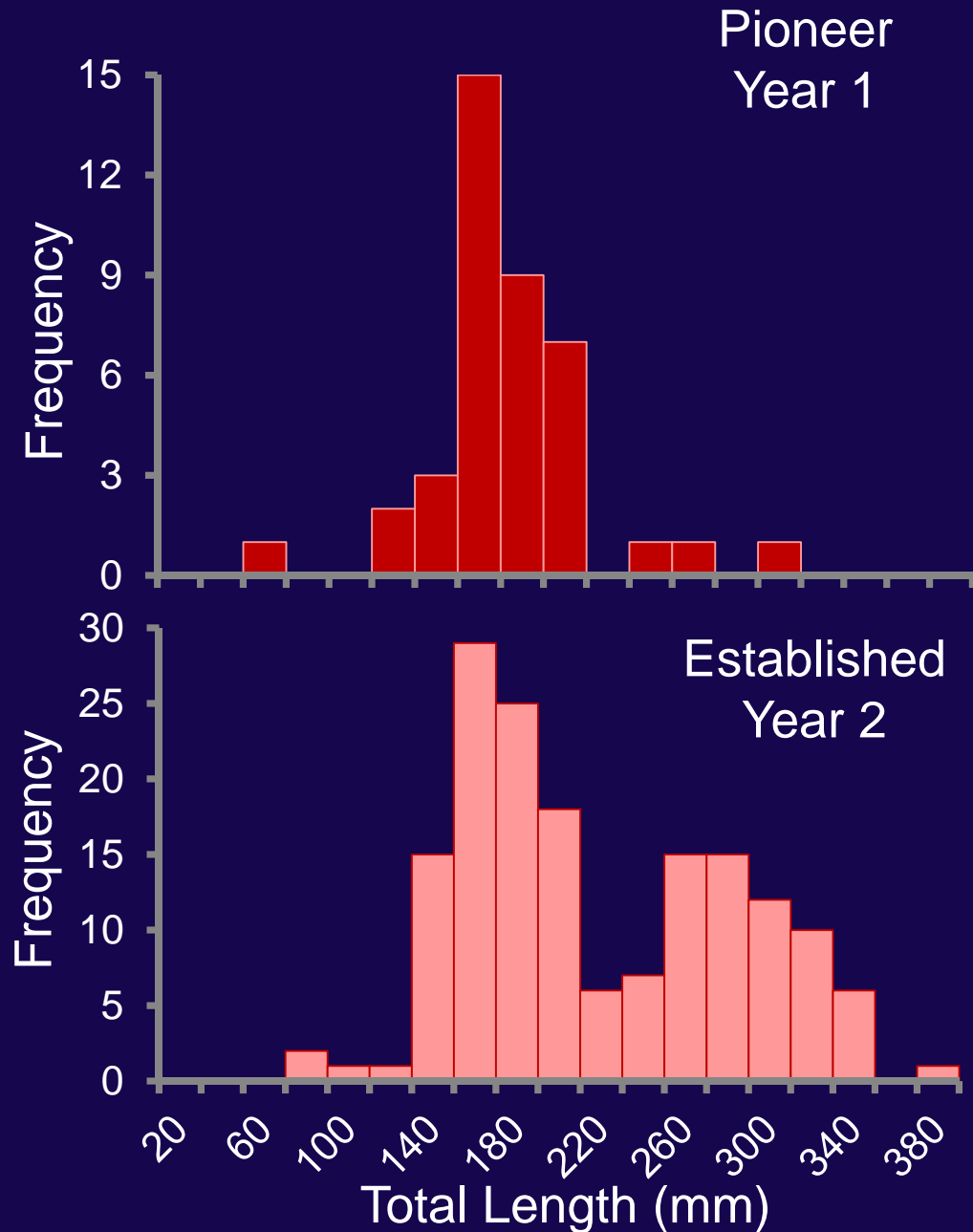


# Biological characteristics:

## size-frequency



- Pioneers were juveniles
- Established population shows 2 cohorts



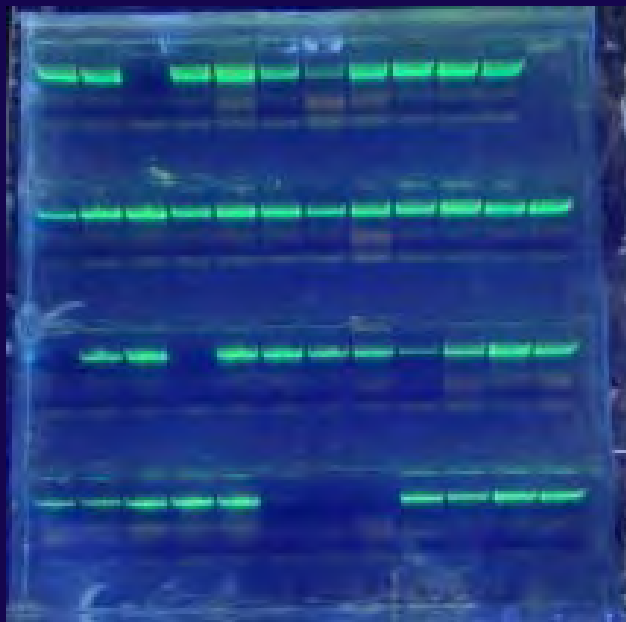
# Biological characteristics:

diet, behaviour, maturity and gender

- Diet – small fishes, lobster pueruli, other invertebrates
- Depth range 1.5 – 182 m
- Active, hovering behaviour
- Year 1 - 63% immature
- Sex ratio 1:1



# Biological characteristics: genetic diversity



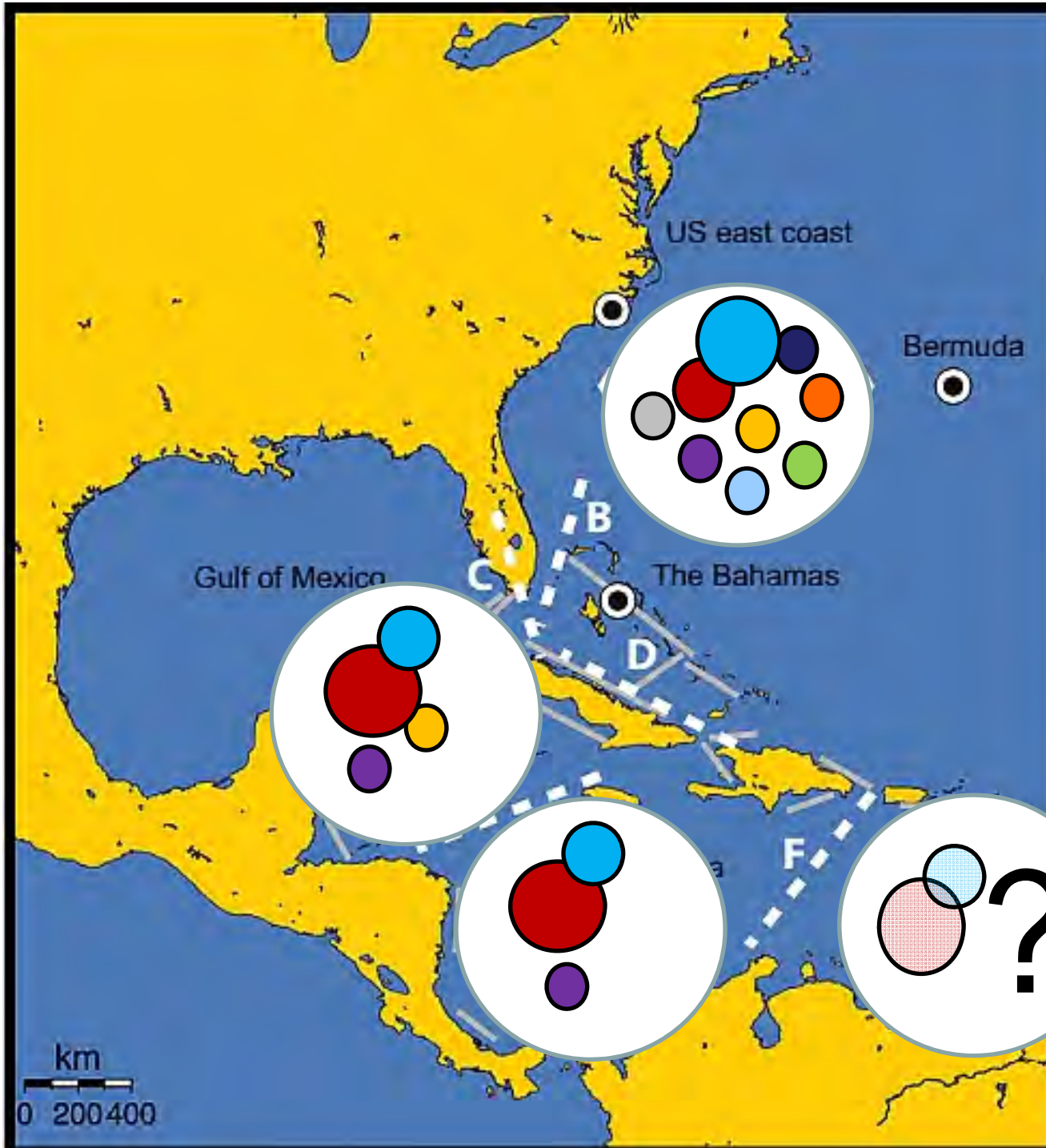
Checking quality of amplified mtDNA d-loop fragments under UV light

- Collected muscle tissue (n = 178 lionfish)
- Amplified mt d-loop using lionfish specific primers (see Freshwater et al. 2009)
- Sequenced at MCLAB, USA
- Aligned with reference sequences in GenBank
- Confirmed single species *Pterois volitans*



# Genetic diversity

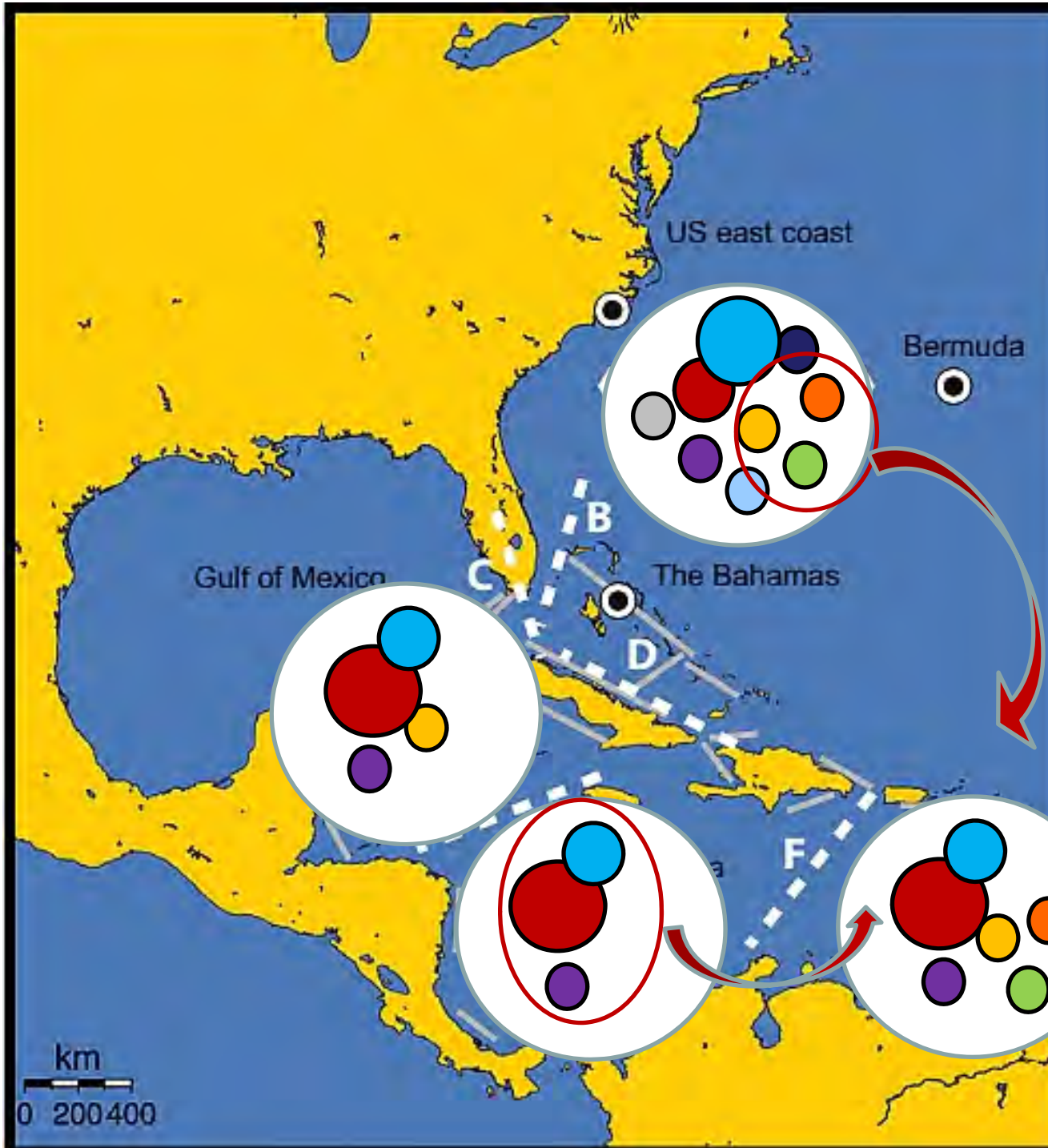
- Northern group  
9 haplotypes
- NW Caribbean  
4 haplotypes
- Central Caribbean  
3 haplotypes
- Eastern Caribbean  
maybe 2 ?



Betancur-R et al. (2011)

# Genetic diversity

- Northern group  
9 haplotypes
- NW Caribbean  
4 haplotypes
- Central Caribbean  
3 haplotypes
- Eastern Caribbean  
Pioneers  
3 haplotypes
- Year 2  
6 haplotypes

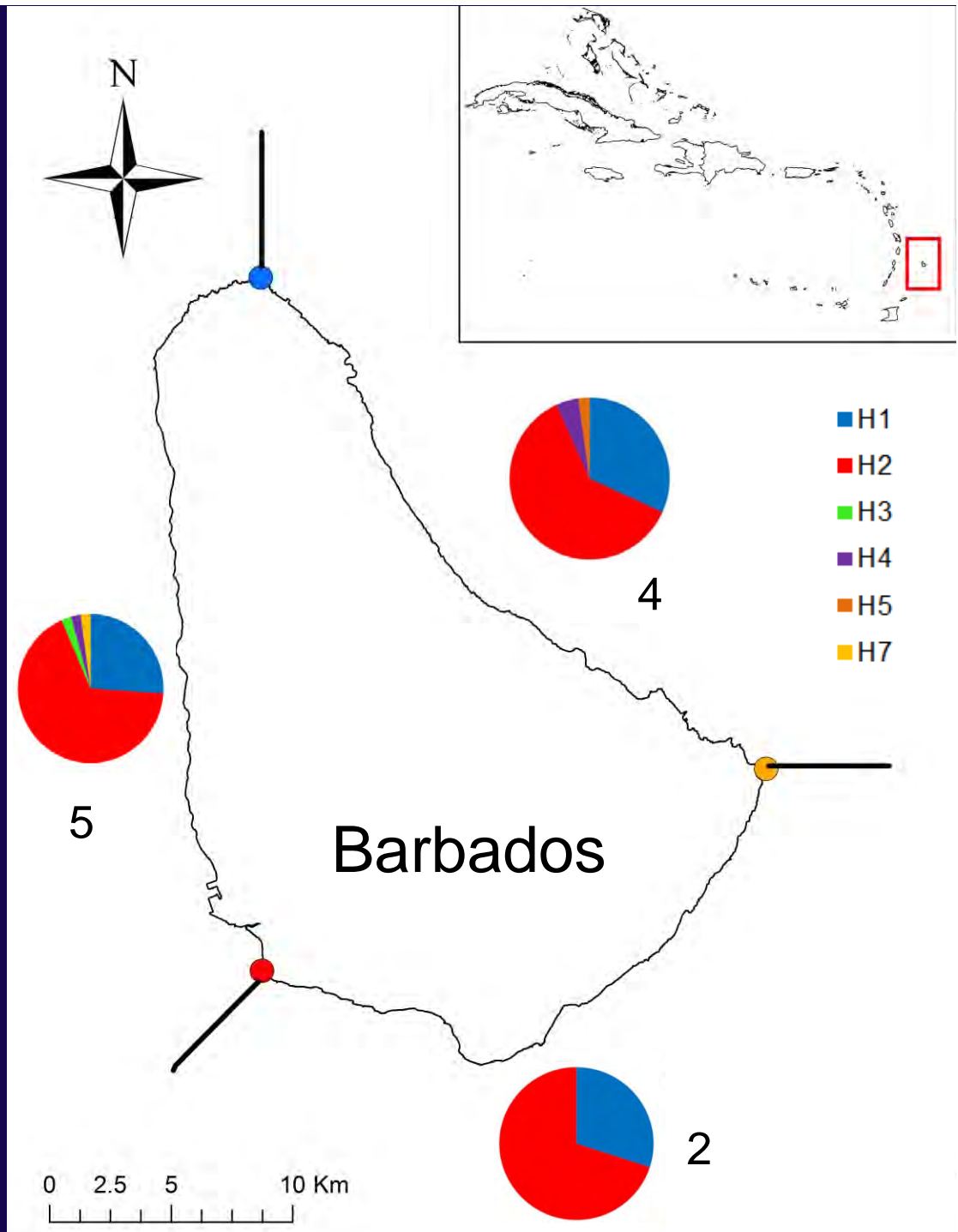


Betancur-R et al. (2011)

# Genetic diversity: coastal differences?

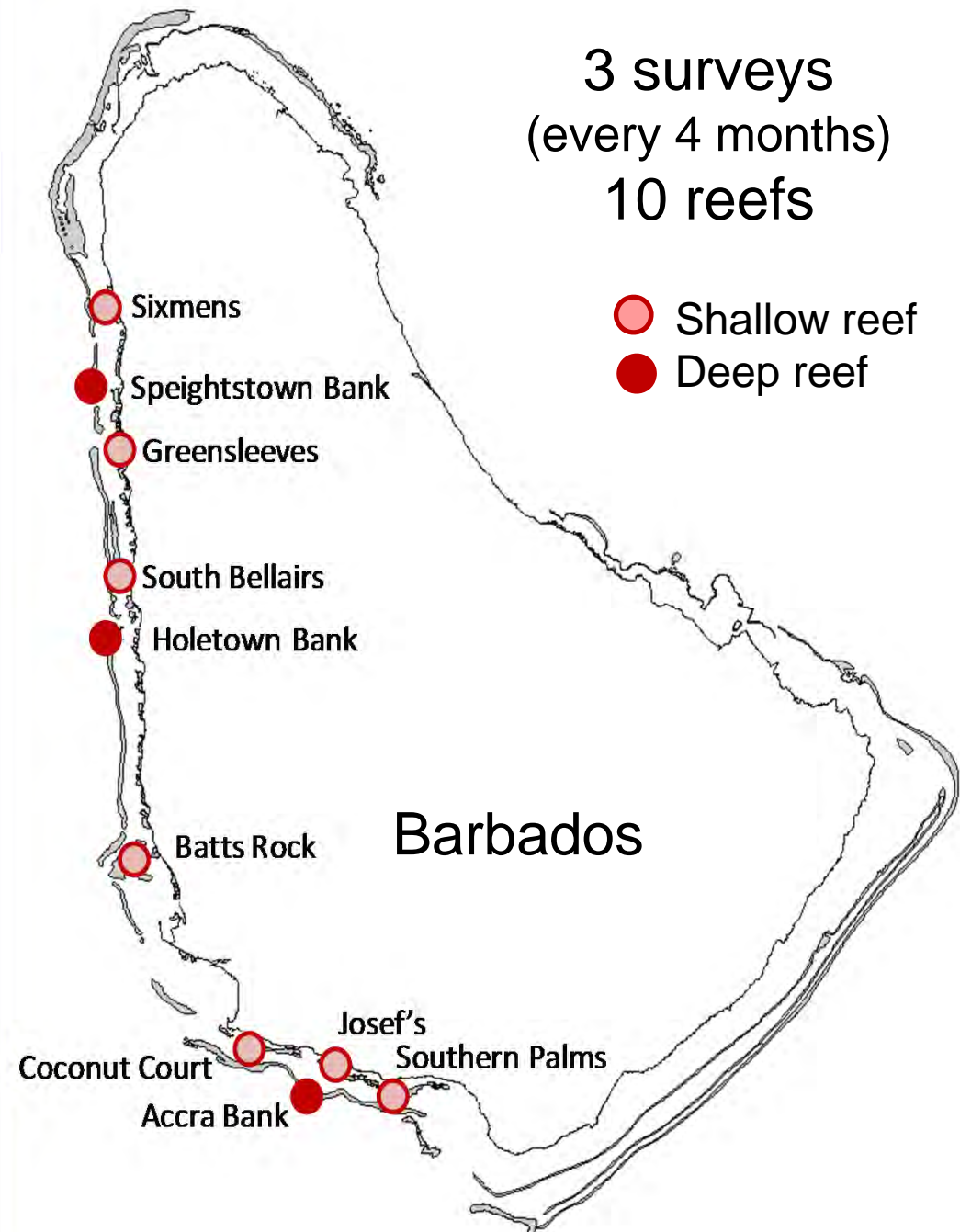
- Difference in the number and frequency of haplotypes between:
  - year 1 (pioneer) and year 2 (established)
  - among coasts
- Only 2 haplotypes on South coast
- However diversity not significantly different between years or coasts

Source: Sealy (2013)



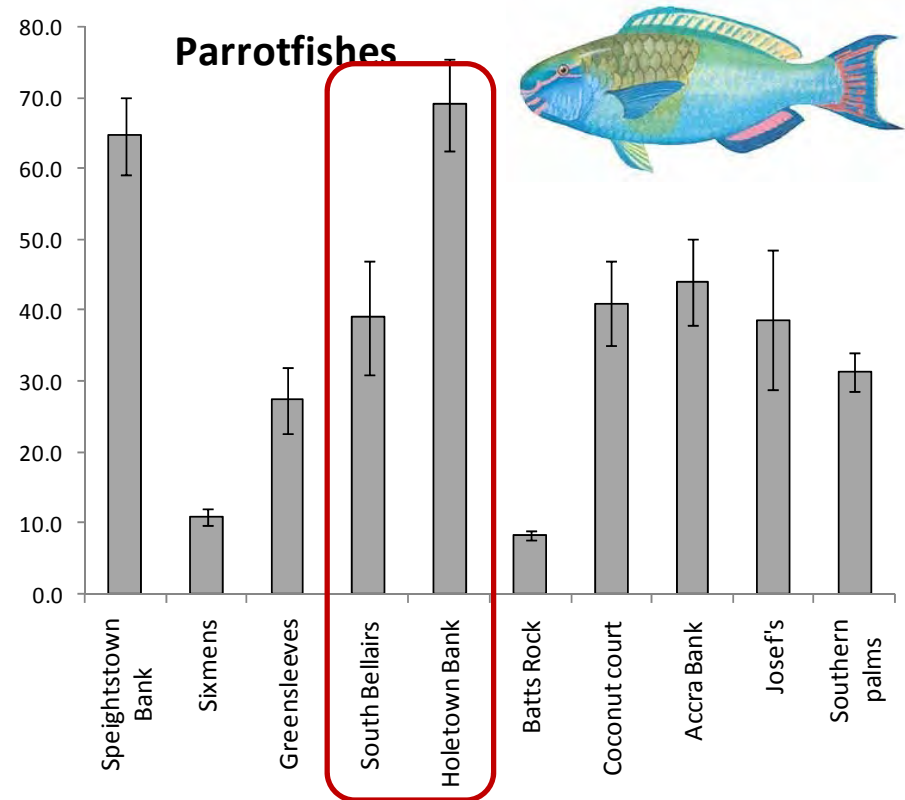
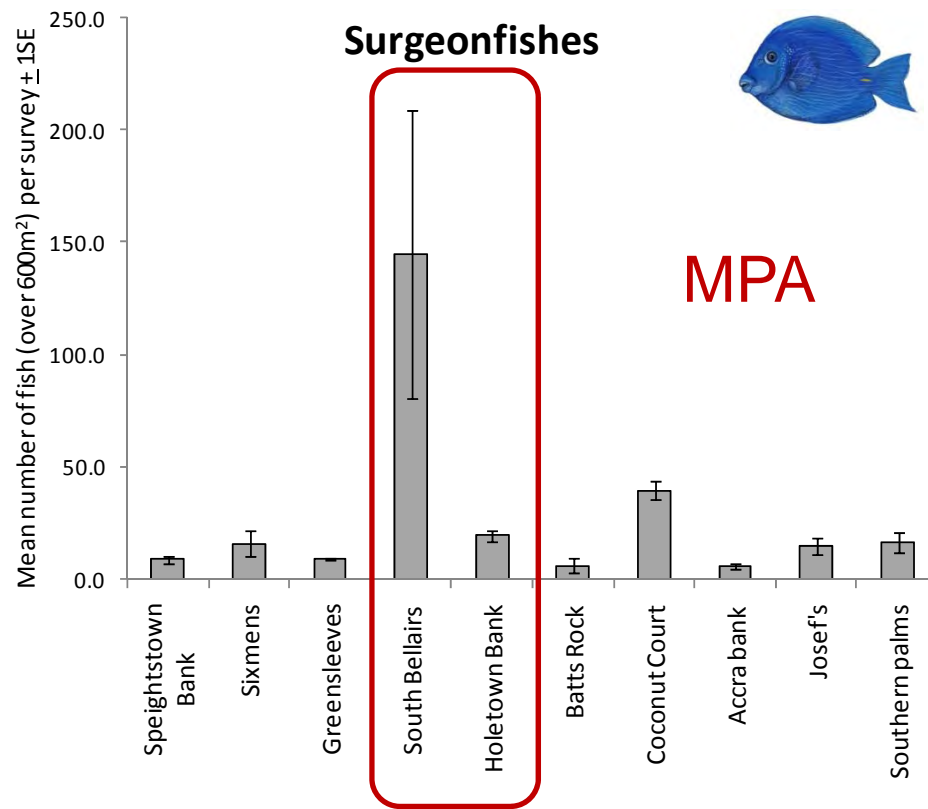
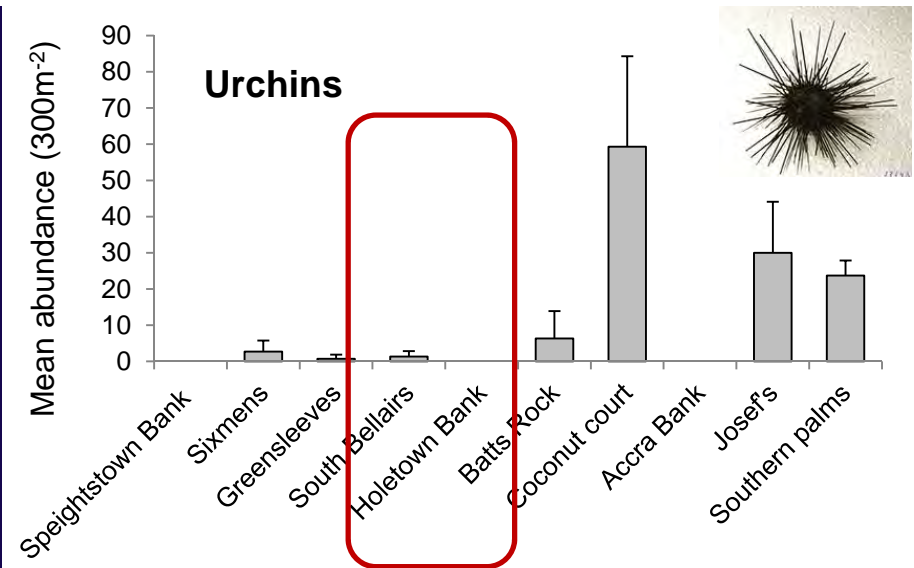
# Impact on: reef communities

- Fringing, patch and bank reefs
- Heavily fished, low resilience
- Collected pre-lionfish data by SCUBA surveys (fish species, abundance, size)



# Pre-lionfish surveys: herbivores

- High variation among reefs
- Low variation among surveys





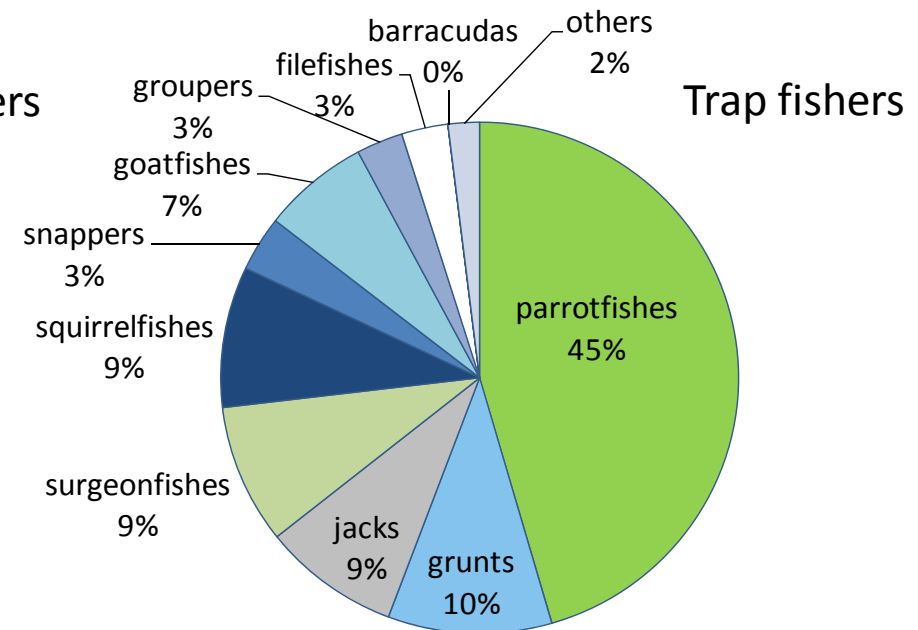
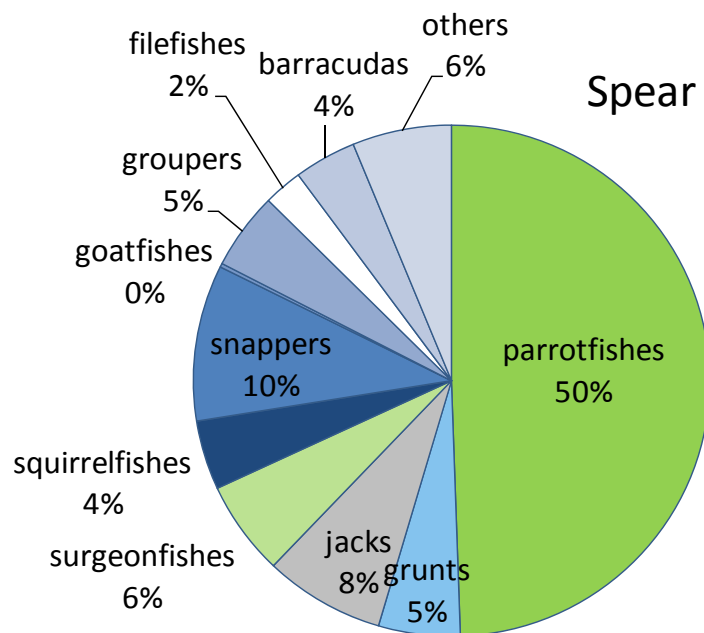
# Impact on: reef fishers

- Approx. 200 reef fishers
- Small scale
- Trap, speargun, handline, seine net
- Pre-lionfish interview survey of fishers  
(catch rate, catch composition, income, livelihood dependence)
- 2 surveys (pelagic season and off-season)



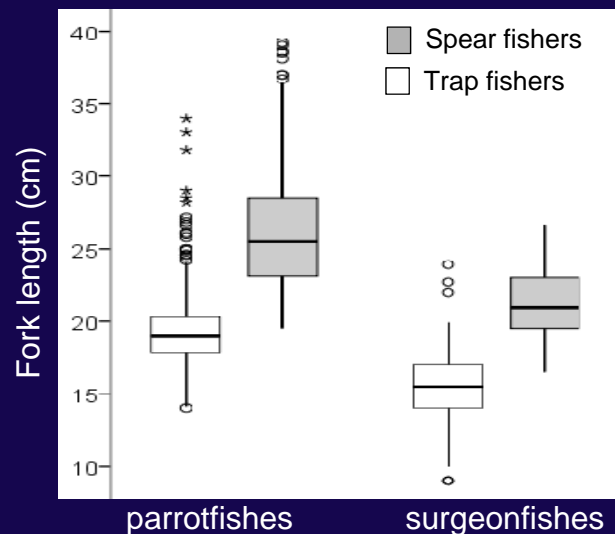
# Pre-lionfish: reef fishers

- Near half of catch is parrotfish
- Spear fishers land more snappers and groupers (15% vs 6%) than trap fishers



# Pre-lionfish: reef fishers

- Trap caught fish are smaller than spear caught fish
- Trap fishers average 10.2 kg at US\$50 per trip
- Spear fishers average 5.6 kg at US\$31 per trip



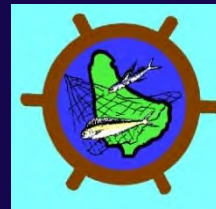
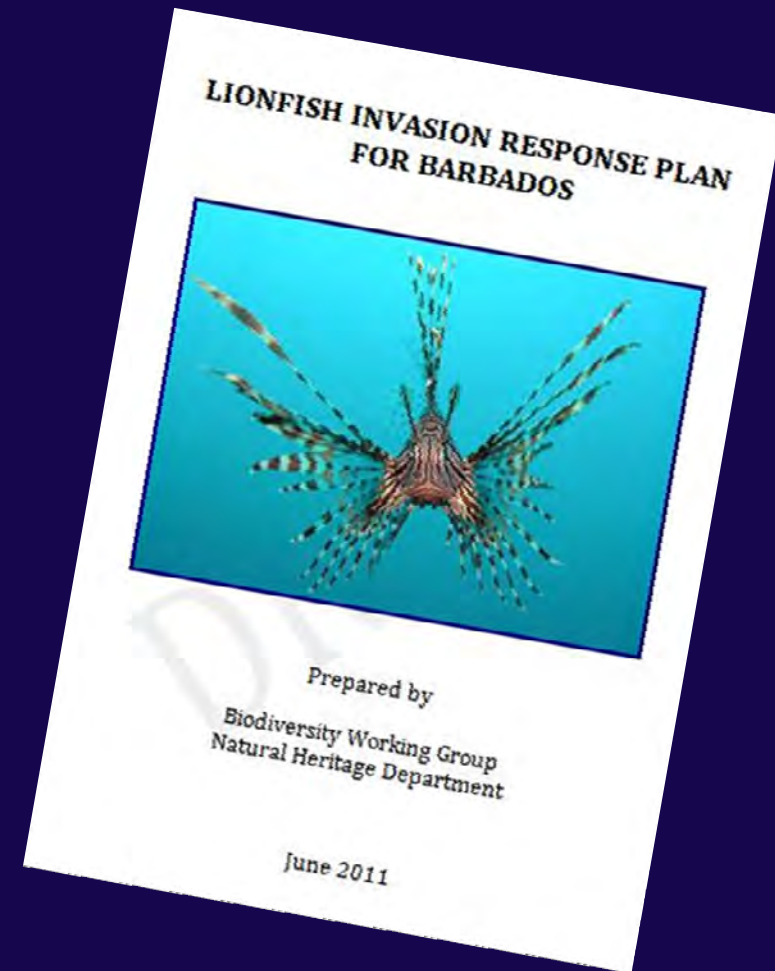
# MPAs and lionfish

- One very small MPA on west coast
- Permission to fish can be granted by Park Manager (for research purposes)
- Lionfish issue not specifically addressed to date



# Response Plan

- Plenty of warning
- Government Biodiversity Working Group drafted a response plan
- Main partners:
  - Fisheries Division - fisher information, receive and store specimens
  - Coastal Zone Management Unit (CZMU) – diver information, public awareness campaign, media point of contact, culling dives
  - University of the West Indies (UWI) – research & education, archive and share data



# Response Plan: Public awareness

- Newspaper articles
- TV interviews
- Workshops – information, capture and safe handling, food preparation
- Brochures



# Response Plan: Public awareness

- Newspaper articles
- TV interviews
- Workshops – information, capture and safe handling, food preparation
- Brochures



## Local fish commonly mistaken for Lionfish



# Response Plan: Public awareness

- 24 hr telephone hotline



- Facebook page
  - News Information, lionfish events, photographs and video footage, private derbies etc.






# Response Plan: Research


- Coordinated sample collection
- Shared data base
- Reef surveys
- Fisher surveys
- Genetic diversity
- Grazing functional status

**LIONFISH SIGHTING FORM**




The red lionfish (*Pterois volitans*). Image courtesy NOAA

Coastal Zone Management Unit  
Bay Street, St. Michael.  
Tel: 2285950/ 1/ 2  
Fax: 2285956  
[info@coastal.gov.bb](mailto:info@coastal.gov.bb)



Fisheries Division,  
Ministry of Agriculture, Food,  
Fisheries, Industry and  
Small Business Development  
Bridgetown  
Tel: 4263745/ 4265973/ 4278480  
Fax: 4369068  
[fishbarbados@caribsurf.com](mailto:fishbarbados@caribsurf.com)



**RECORD NO (Official use only):** \_\_\_\_\_

**Data Recorder:** \_\_\_\_\_ **Contact #:** \_\_\_\_\_

**Observer** \_\_\_\_\_ **Contact #:** \_\_\_\_\_  
(if not the same as Recorder):

**Date of sighting:** (dd/mm/yy) \_\_\_/\_\_\_/\_\_\_ **Time of sighting:** \_\_\_\_\_

**Sighting Location:**  
Site Name: \_\_\_\_\_ Landmarks: \_\_\_\_\_  
Latitude: \_\_\_\_\_ Longitude: \_\_\_\_\_  
Depth: \_\_\_\_\_

**Habitat Type:**  
 Sand     Rubble     Patch Reef     Bank Reef     Fringe Reef     Sea grass  
 Other (Specify) \_\_\_\_\_

**Activity of the observer:**  
 Diving     Fishing     Swimming     Other (Specify) \_\_\_\_\_

**Number of lionfish observed:** \_\_\_\_\_

**Approximate size (or size range if more than 1 fish)** \_\_\_\_\_ (cm/ inches)

**What was the lionfish doing?**  
 Hiding     Hovering     Swimming     Feeding     Other (Specify) \_\_\_\_\_

**Was fish caught? If yes what gear was used?** \_\_\_\_\_

**PLEASE SUBMIT COMPLETED FORM TO THE FISHERIES DIVISION OR COASTAL ZONE MANAGEMENT UNIT.  
PLEASE CALL IF YOU NEED THE FORM COLLECTED.**

# Response Plan: Eradication strategy

- CZMU culling dives
- Sport dive operators spear on regular dives
- Encourage fishery
- Lionfish derbies & cook-ups to encourage market
  - Private
  - Government



# Future steps

- Continue public awareness campaign
- Collaborate with first response medical teams (life guards, emergency doctors)
- Continue encouraging dive operators
- Hold workshop with chefs on safe preparation of lionfish dishes
- Engage MPhil / PhD students in research
- Repeat surveys to quantify ecological and socioeconomic impacts





**Thank you**

**Any Questions?**

# Acknowledgements

- Lionfish response plan partners CZMU and Fisheries Division
- Research funders – Government of Barbados & UWI
- Dive operators – especially Barbados Blue, High Tide Water Sports, Roger's SCUBA Shack
- Reef fishers
- Researchers / divers / photographers – especially Shekira Sealy, Caroline Bissada, Julian Walcott, Myles Phillips, Renata Goodridge