Invasive Lionfish in Barbados

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Lionfish & Sea Cucumber Workshop
Havana, Cuba
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Progression of lionfish invasion

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

Progression of lionfish invasion

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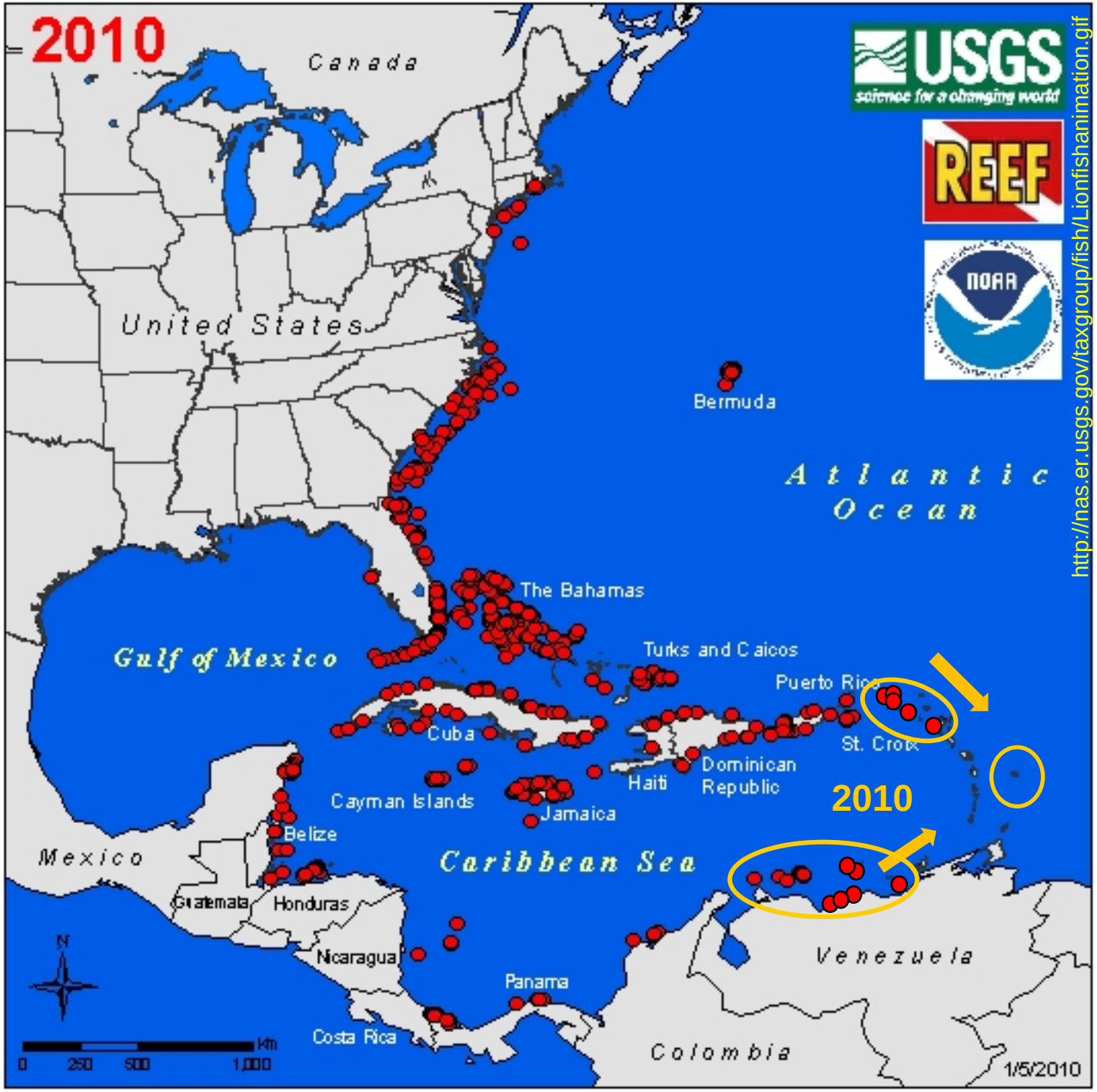
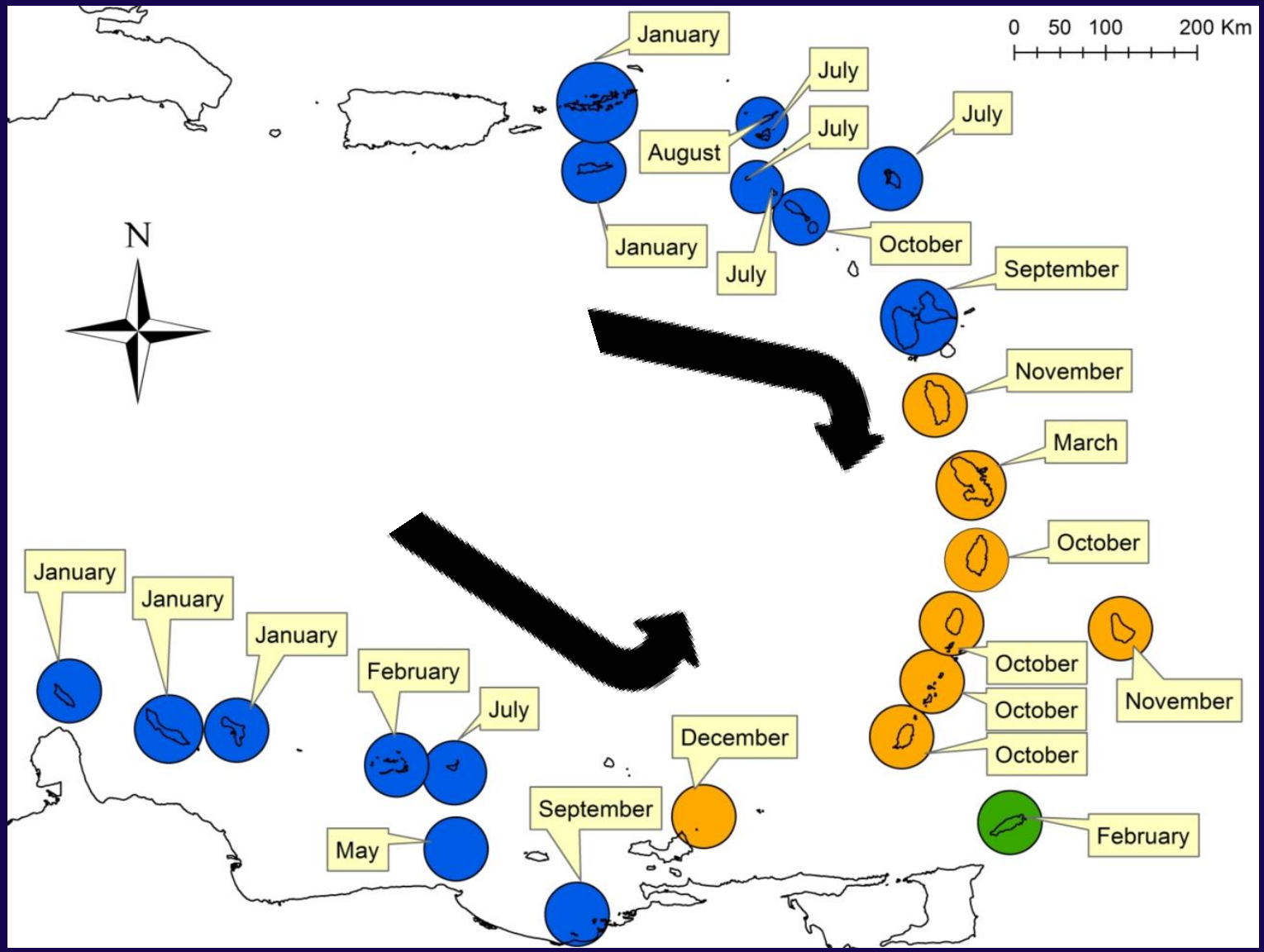


Invasion chronology in the Lesser Antilles: 2010-2012



2010

2011

2012

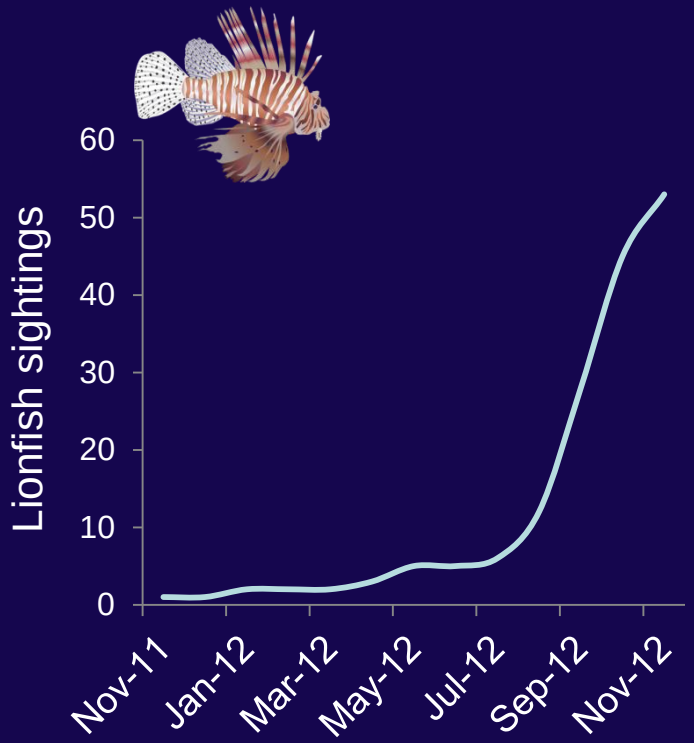
From reported records to the USGS-NAS database at http://nas.er.usgs.gov

Progression of lionfish invasion

Invasion chronology

Year 1

54 confirmed sightings in first year Nov 2011-2012



Barbados

May 2012

November 2011

May 2012

January 2012

July 2012

April 2012

May 2012

August 2012

September 2012

October 2012

July 2012

1 mile

Distribution of samples

Year 2

- Rough seas
- No fishing
- No reef

W

E

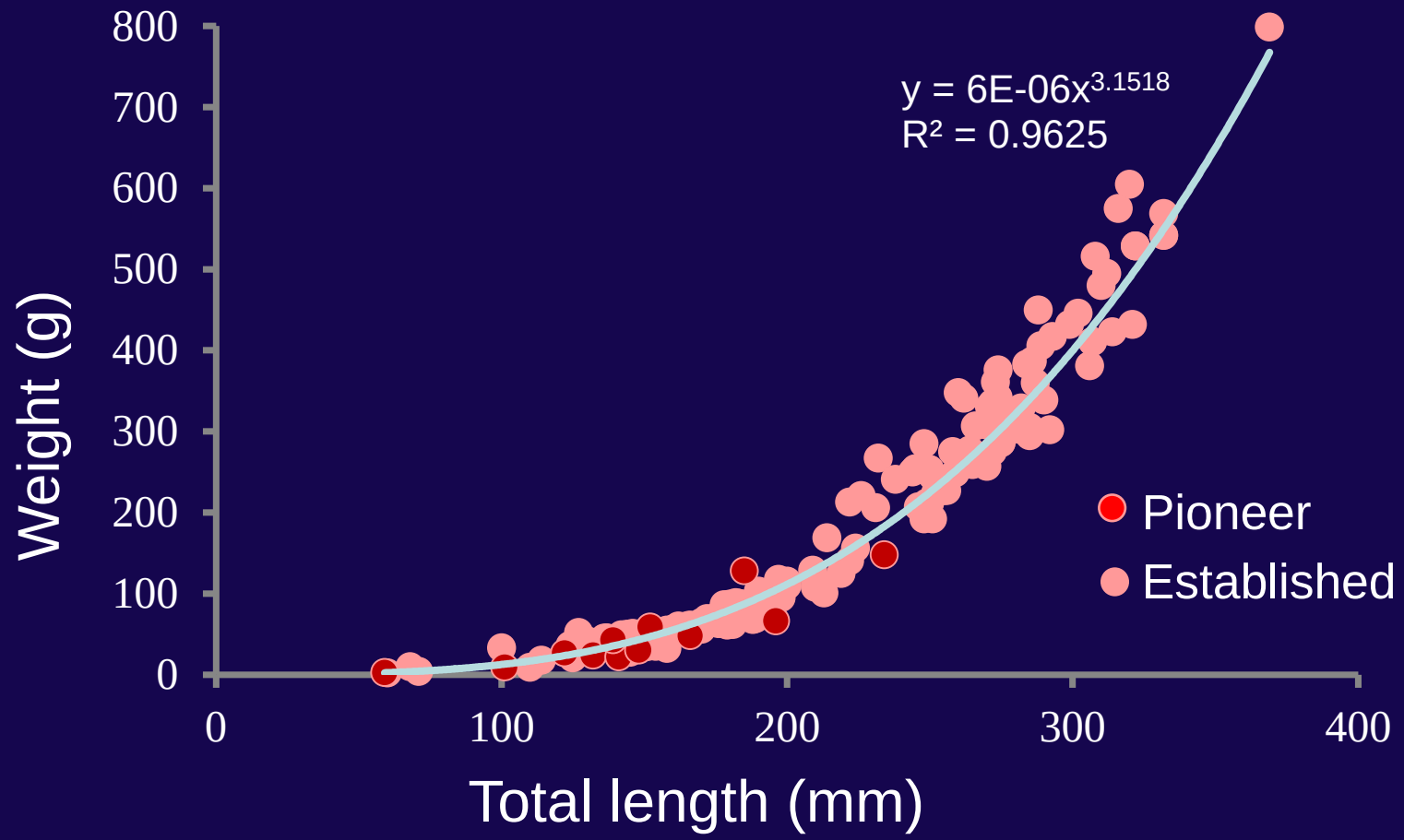
S

Barbados

1 mile

Biological characteristics:

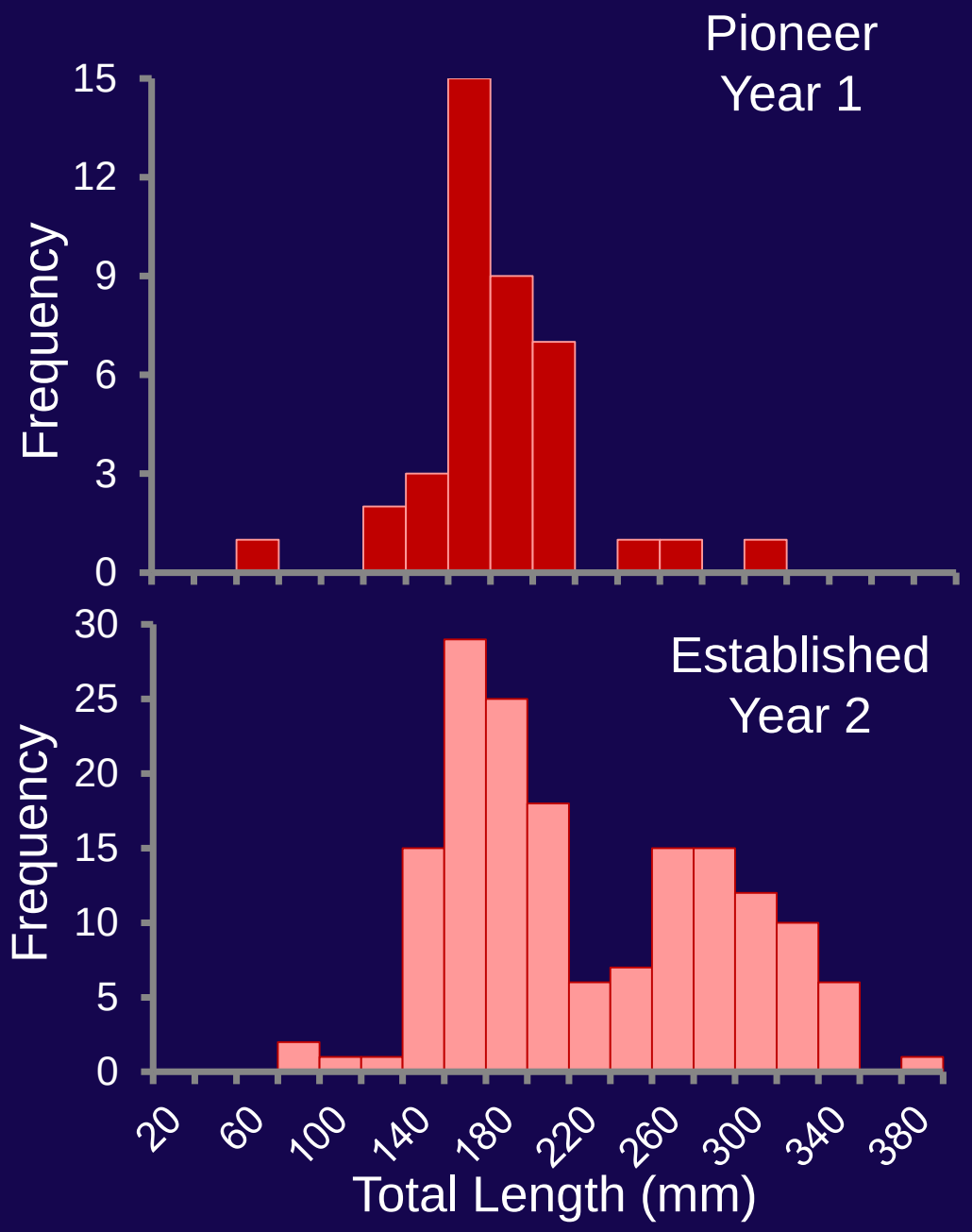
length-weight relationship



Biological characteristics:

size-frequency

- Pioneers were juveniles
- Established population shows 2 cohorts



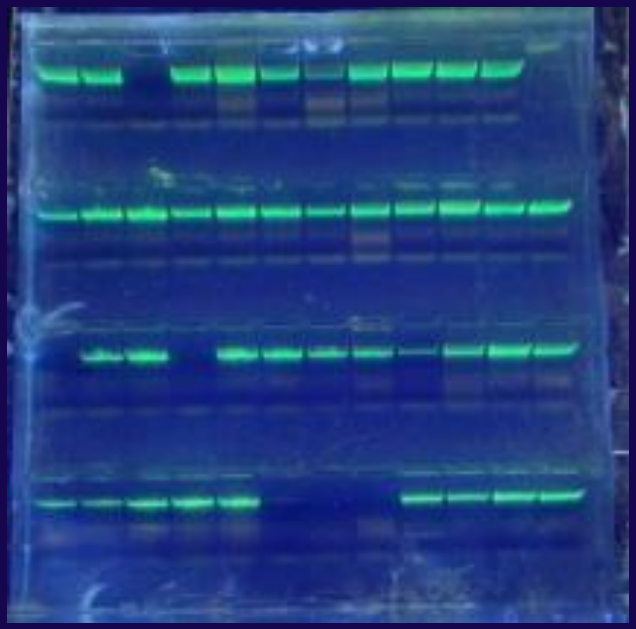
Biological characteristics:

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:

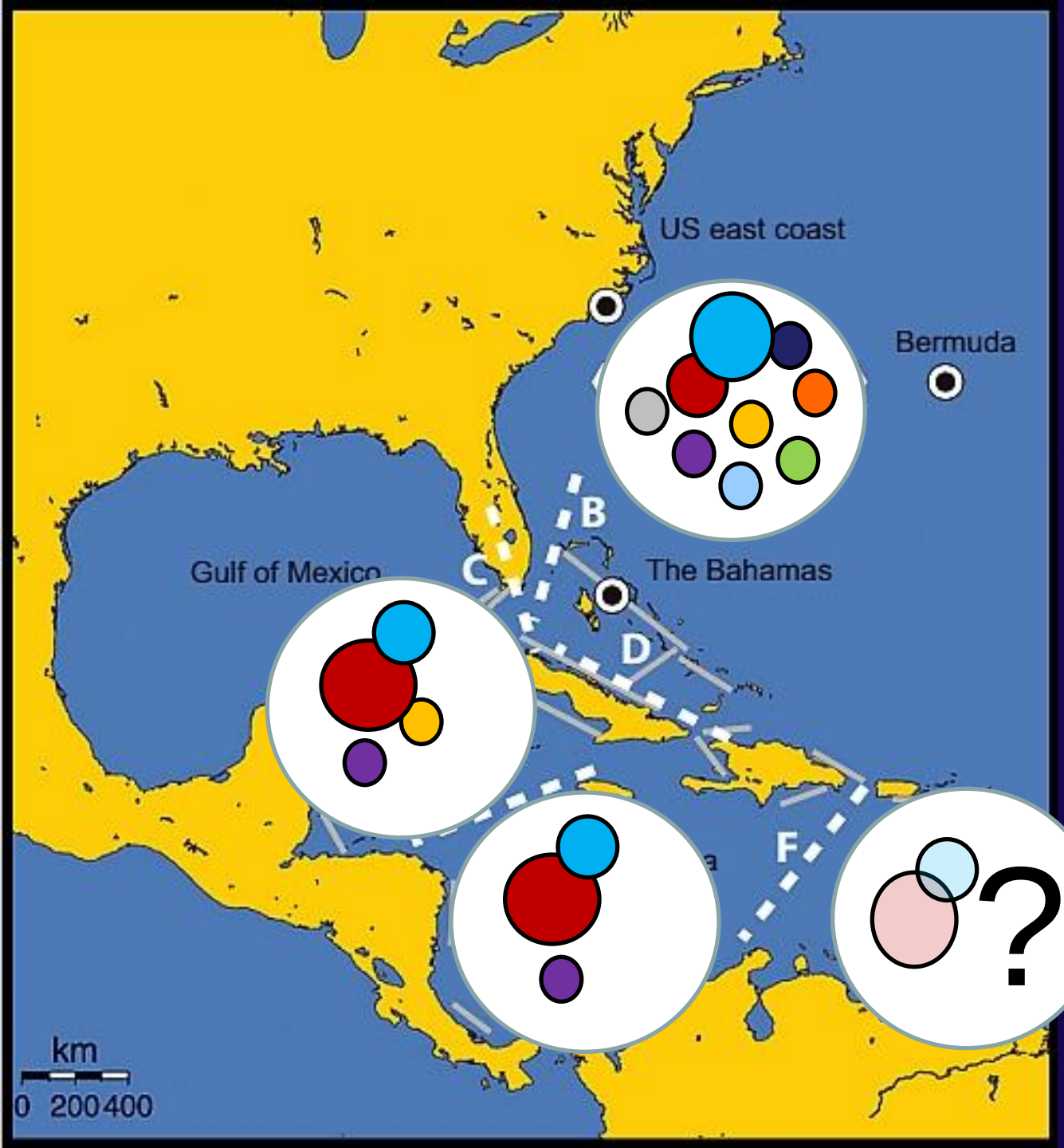
genetic diversity



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*

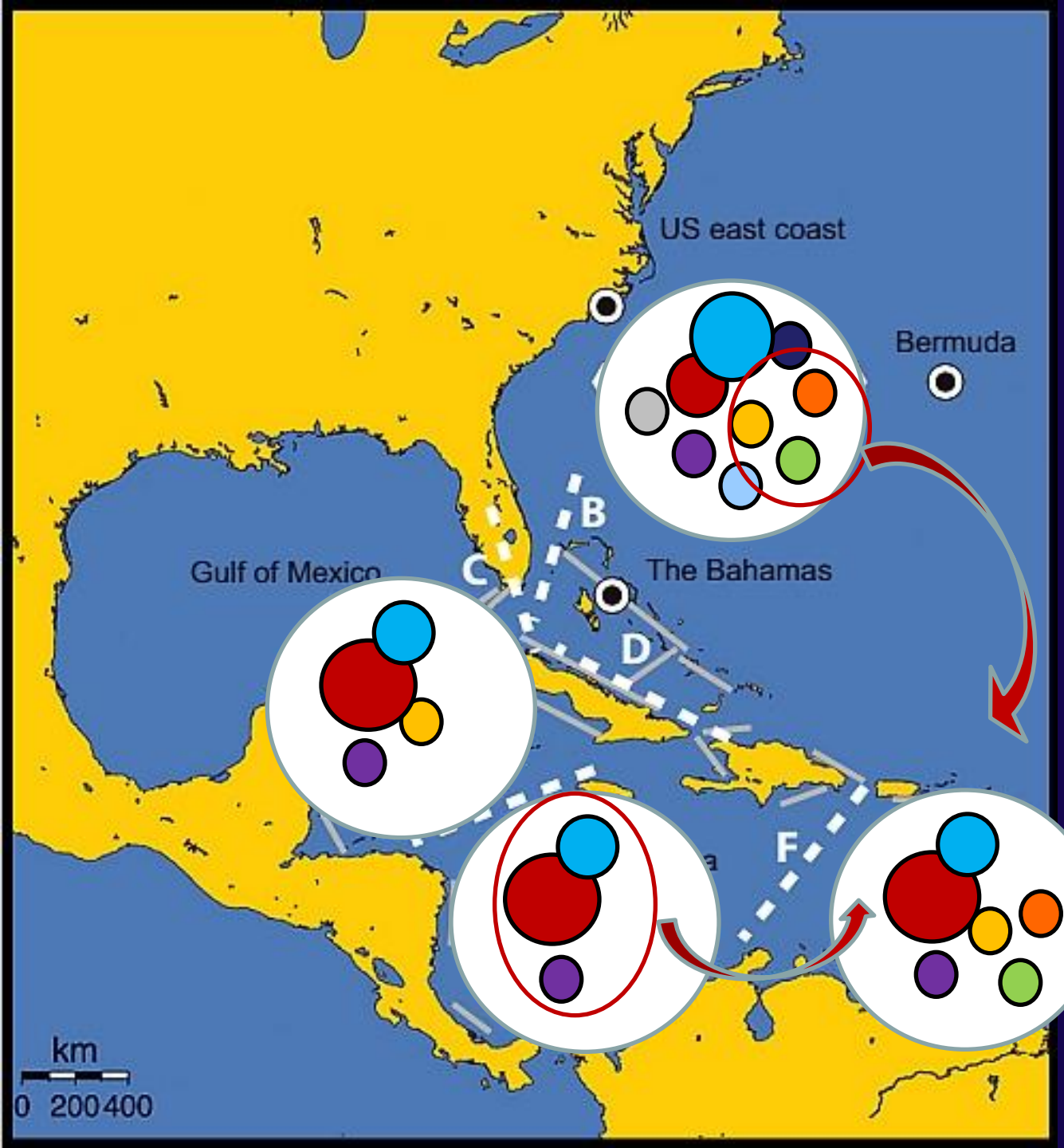
Genetic diversity



- 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

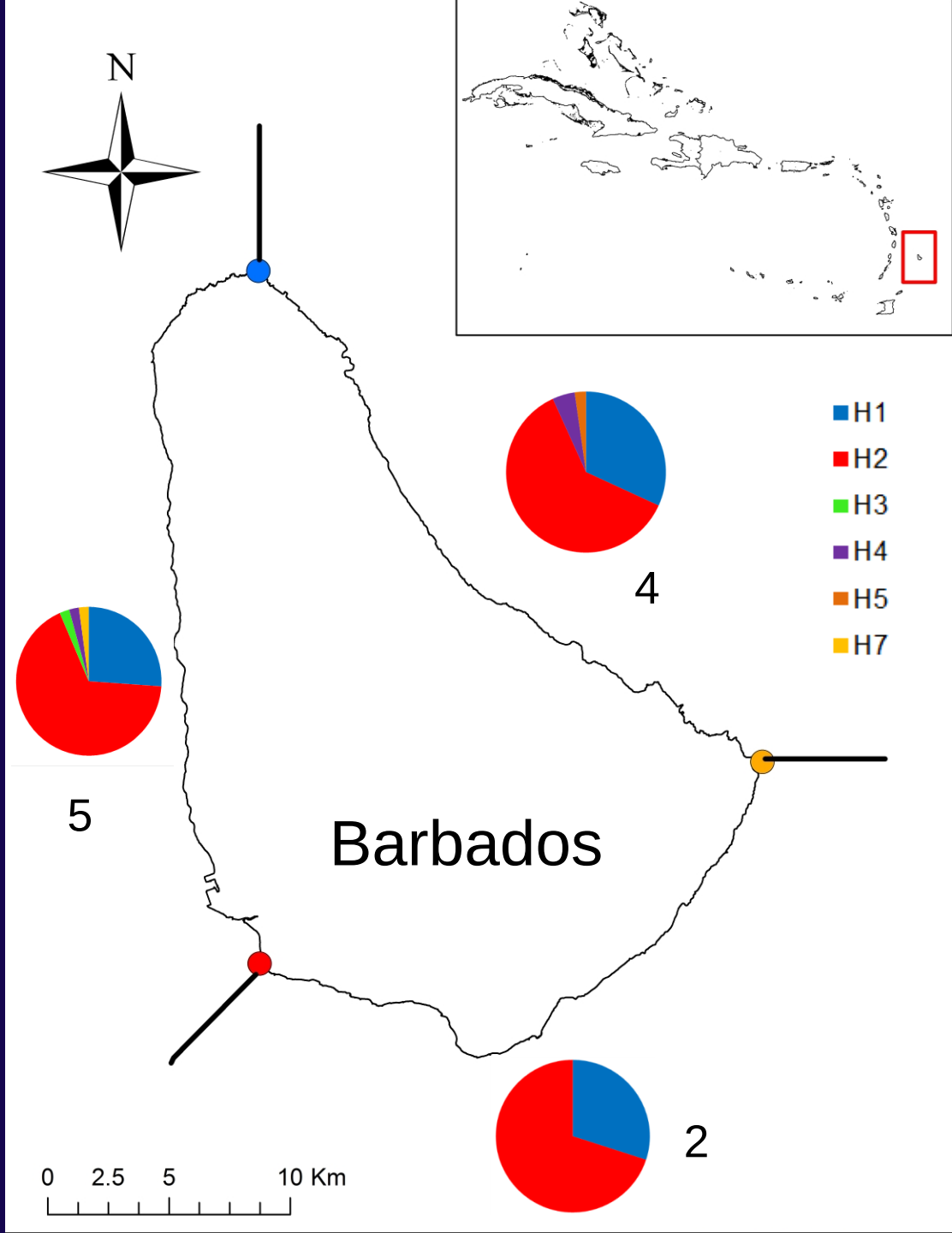
  Year 2
  6 haplotypes

Betancur-R et al. (2011)

Genetic diversity:
coastal differences?

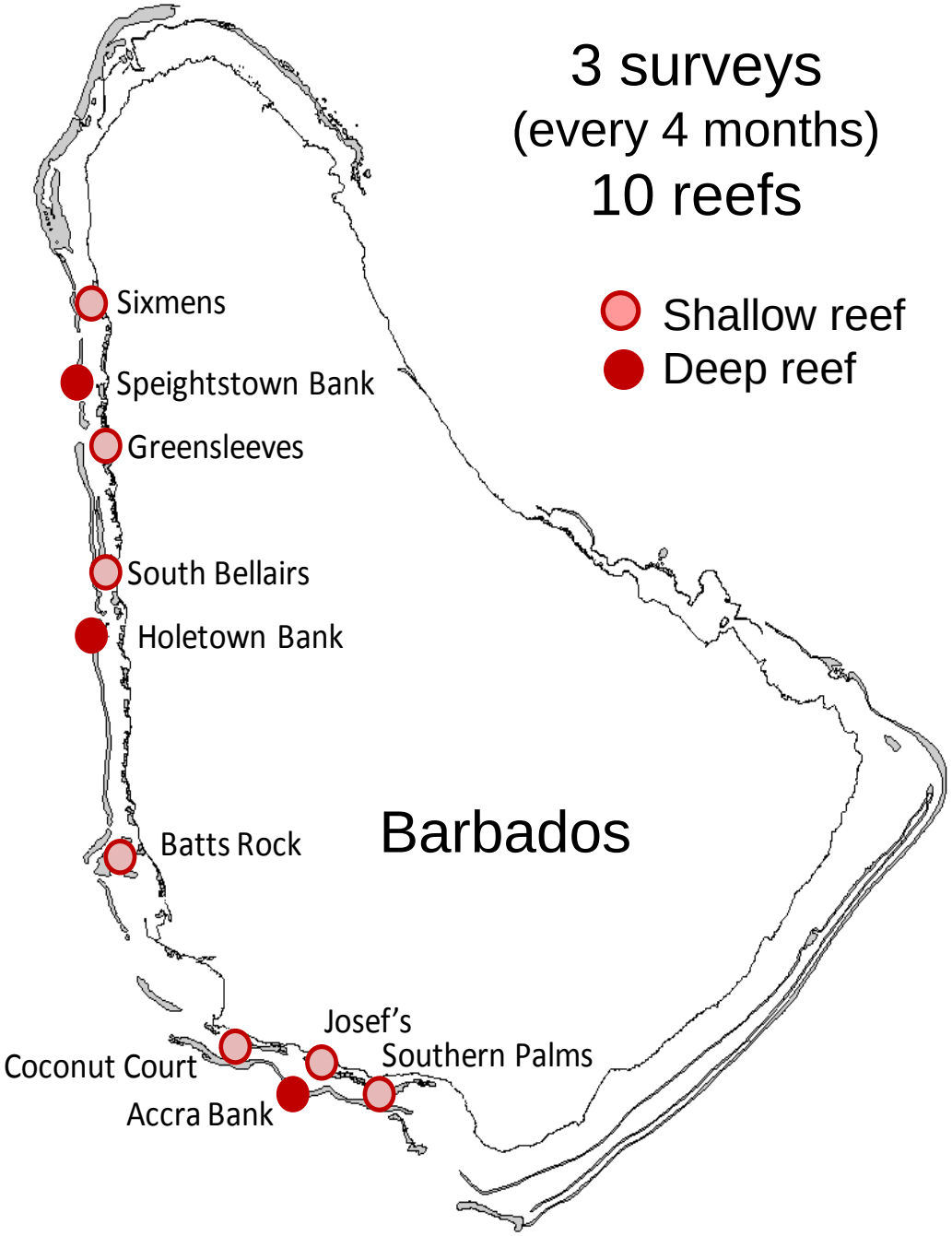
- Difference in the number and frequency of haplotypes between:
  - year 1 (pioneer) and year 2 (established)
  - among coasts
- Only 2 haplotypes on South coast
- However diversity not significantly different between years or coasts

Source: Sealy (2013)



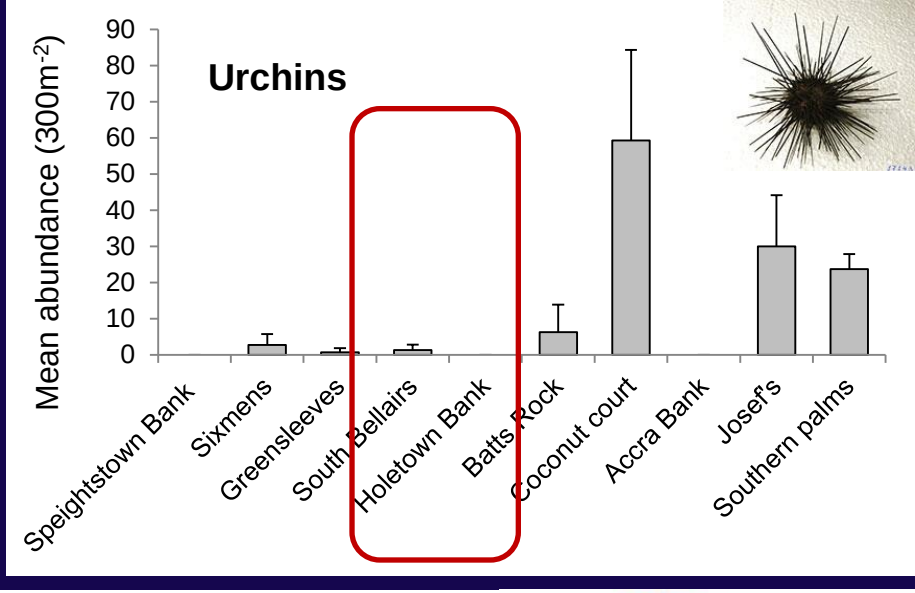
Impact on: reef communities

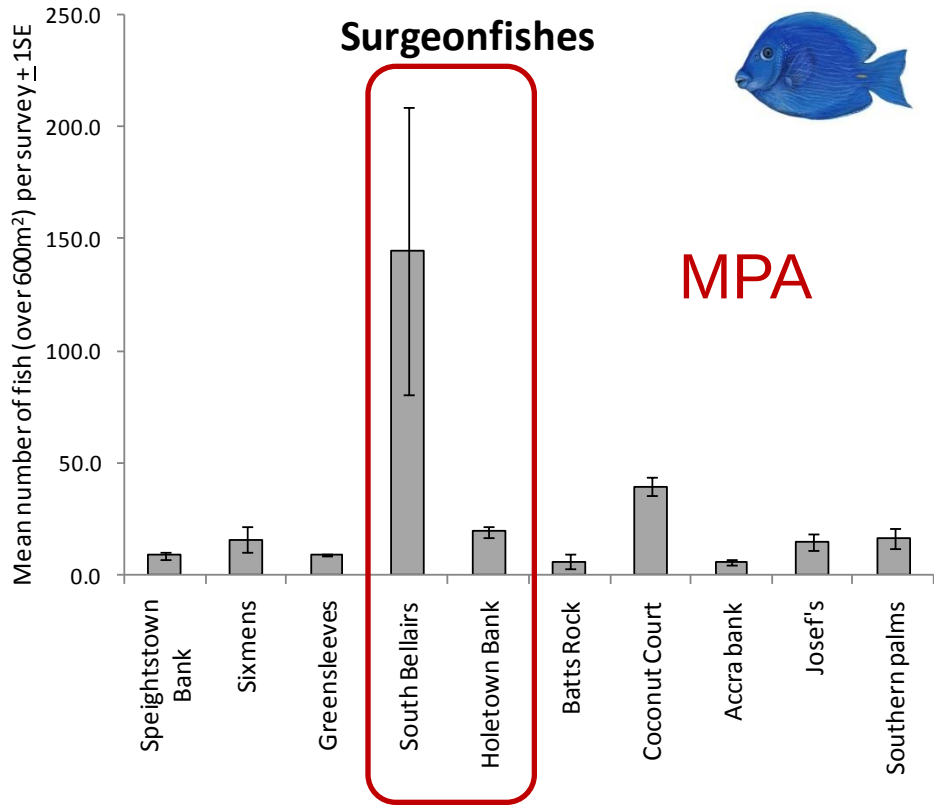
- Fringing, patch and bank reefs
- Heavily fished, low resilience
- Collected pre-lionfish data by SCUBA surveys (fish species, abundance, size)

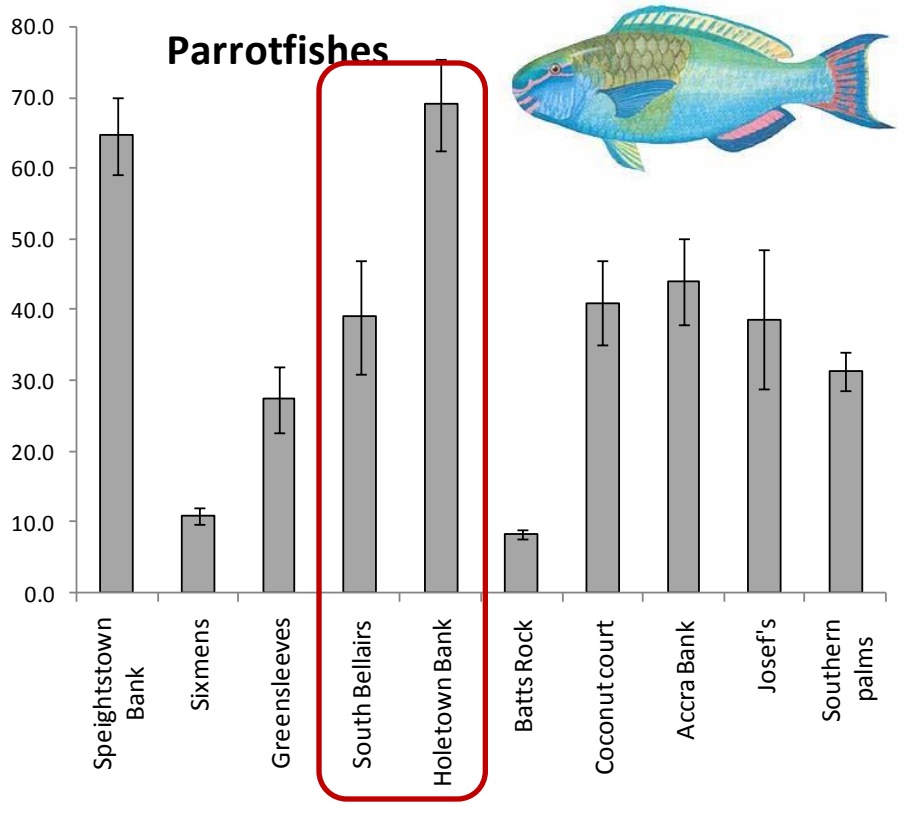


Pre-lionfish surveys:
herbivores

- High variation among reefs
- Low variation among surveys





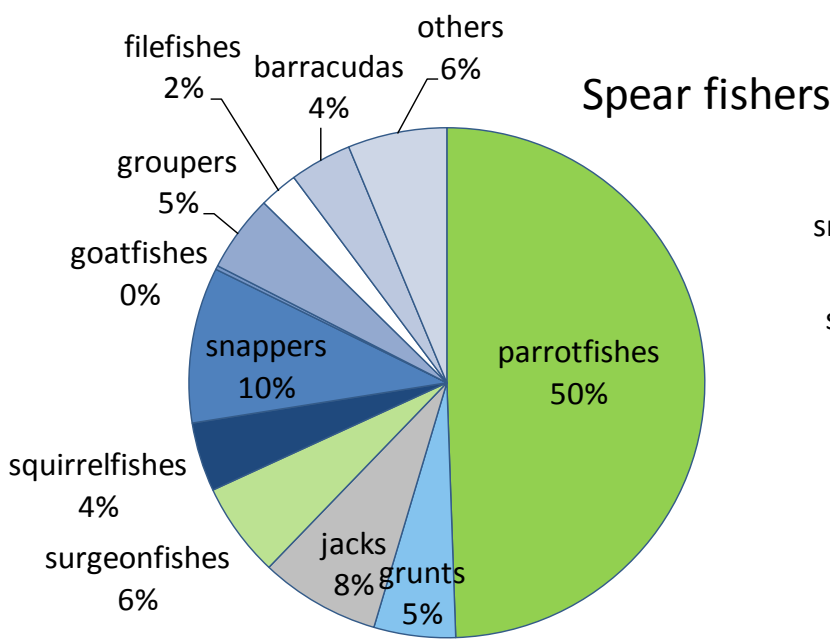


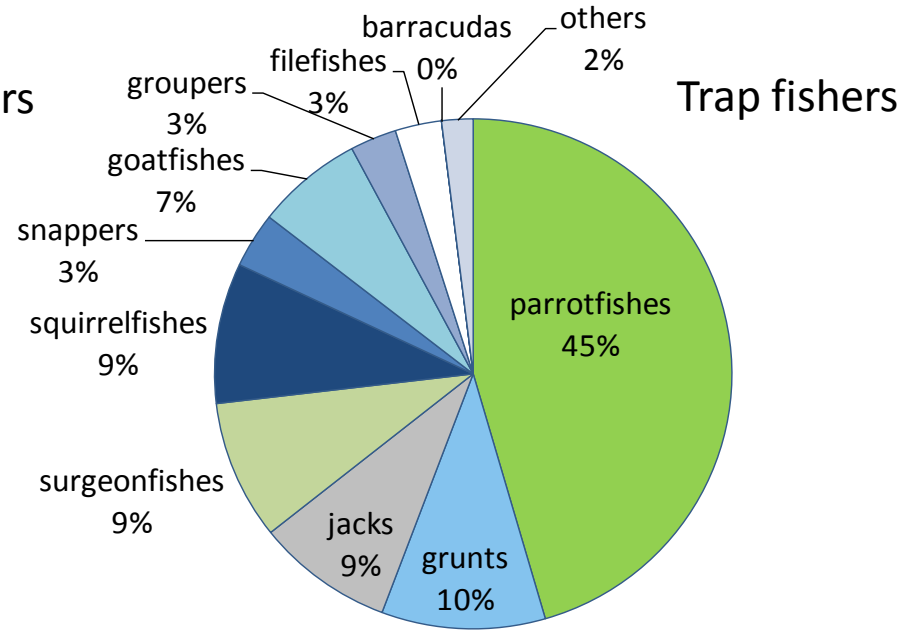
Impact on:
reef fishers

- 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

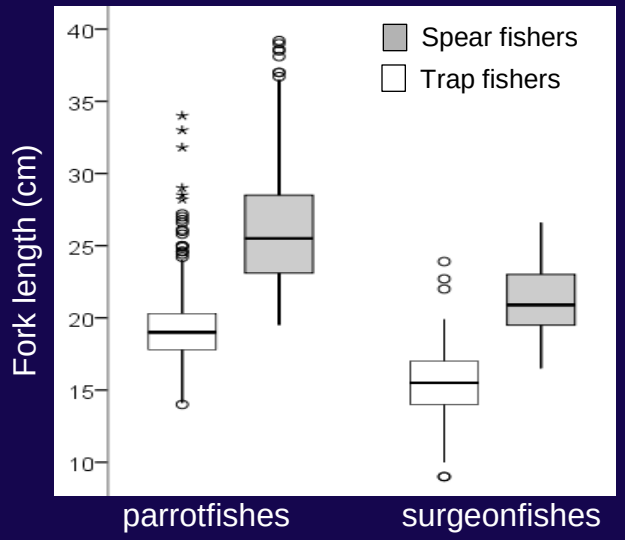
- Near half of catch is parrotfish
- Spear fishers land more snappers and groupers (15% vs 6%) than trap fishers





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

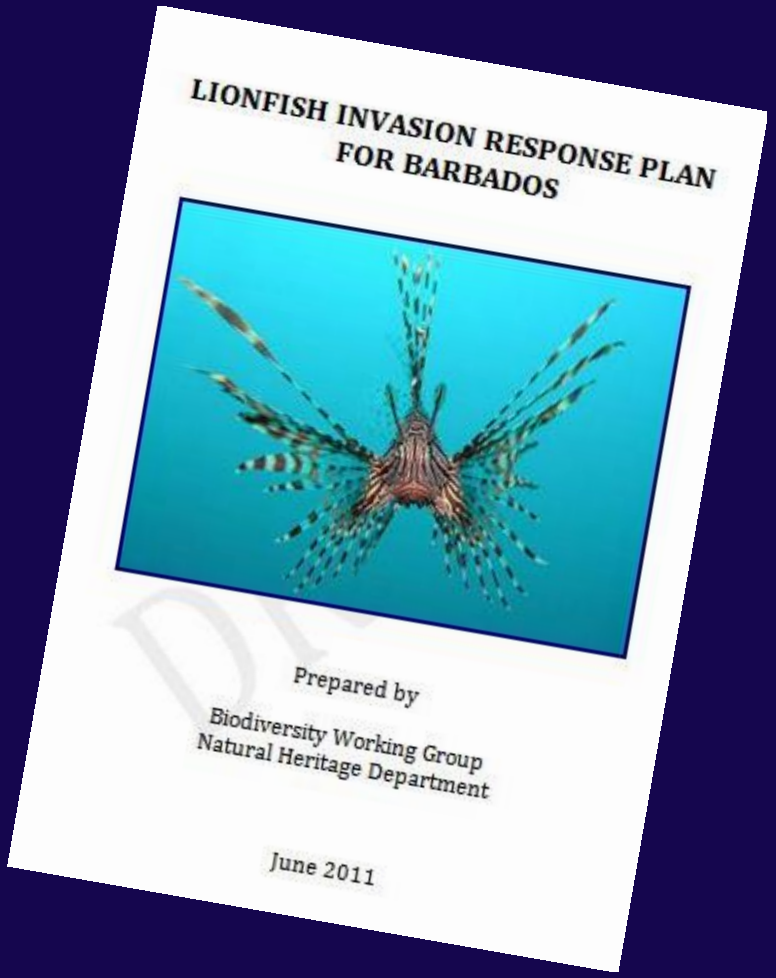


MPAs and lionfish

- 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

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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

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

RECORD NO (*Official use only*): _____

Data Recorder: _____ ***Contact #***: _____

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

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 to cull
- 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
- Co-supervisor for genetic research – Dr. Darren Browne
- Dive operators – especially Barbados Blue, High Tide Water Sports, Roger's SCUBA Shack
- Reef fishers of Oistins and Pile Bay
- Researchers / divers / photographers – especially Shekira Sealy, Caroline Bissada, Julian Walcott, Myles Phillips, Renata Goodridge