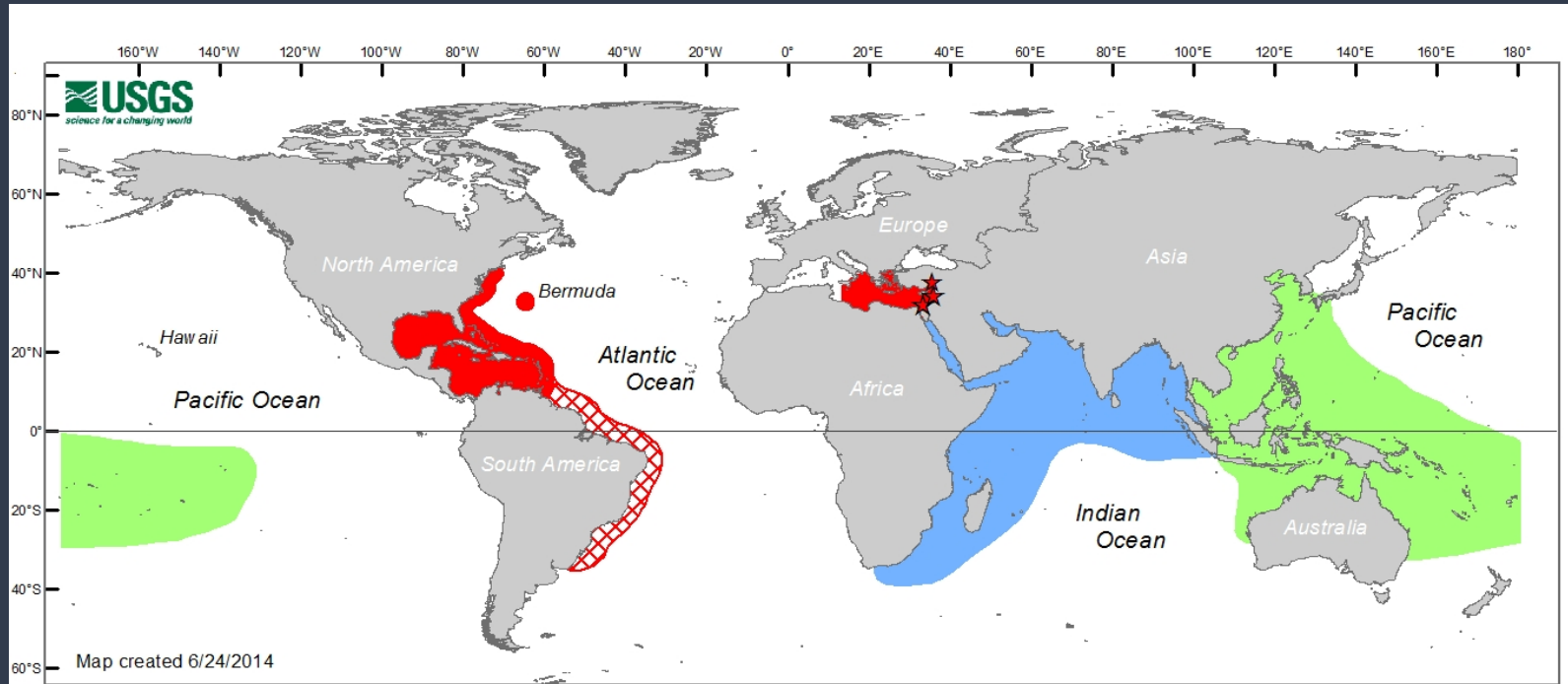


A tropical island with several palm trees and a small, light-colored building. The island is surrounded by clear, turquoise water. The sky is blue with some light clouds. The text is overlaid on a dark blue background.

# Building capacity for effective lionfish management in Belize's fish replenishment zones

Fabian Kyne,  
Belize Marine Fund Conference, May 10, 2022

# Background



Map of native range of *Pterois volitans* (green) and *P. miles* (blue) adapted from Schultz (1986) and Randall (2005). Stars in Mediterranean Sea denote Lessepsian migration of *P. miles* via the Suez Canal (Golani and Sonin 1992; Bariche et al. 2013; Turan et al. 2014). Non-native range of *P. volitans* and *P. miles* in the Americas is shown in red (from Schofield et al. 2012). Predicted future distribution of lionfish along coastal South America is shown in red hatching (Morris and Whitfield 2009). Lionfish are continuing to expand westward in the Mediterranean Sea (red shading). See Azzurro et al. (2017) for a review.

Complete  
eradication  
unlikely



~~Eradication~~



Control

# National Lionfish Management Strategy and working group (2019-2023)

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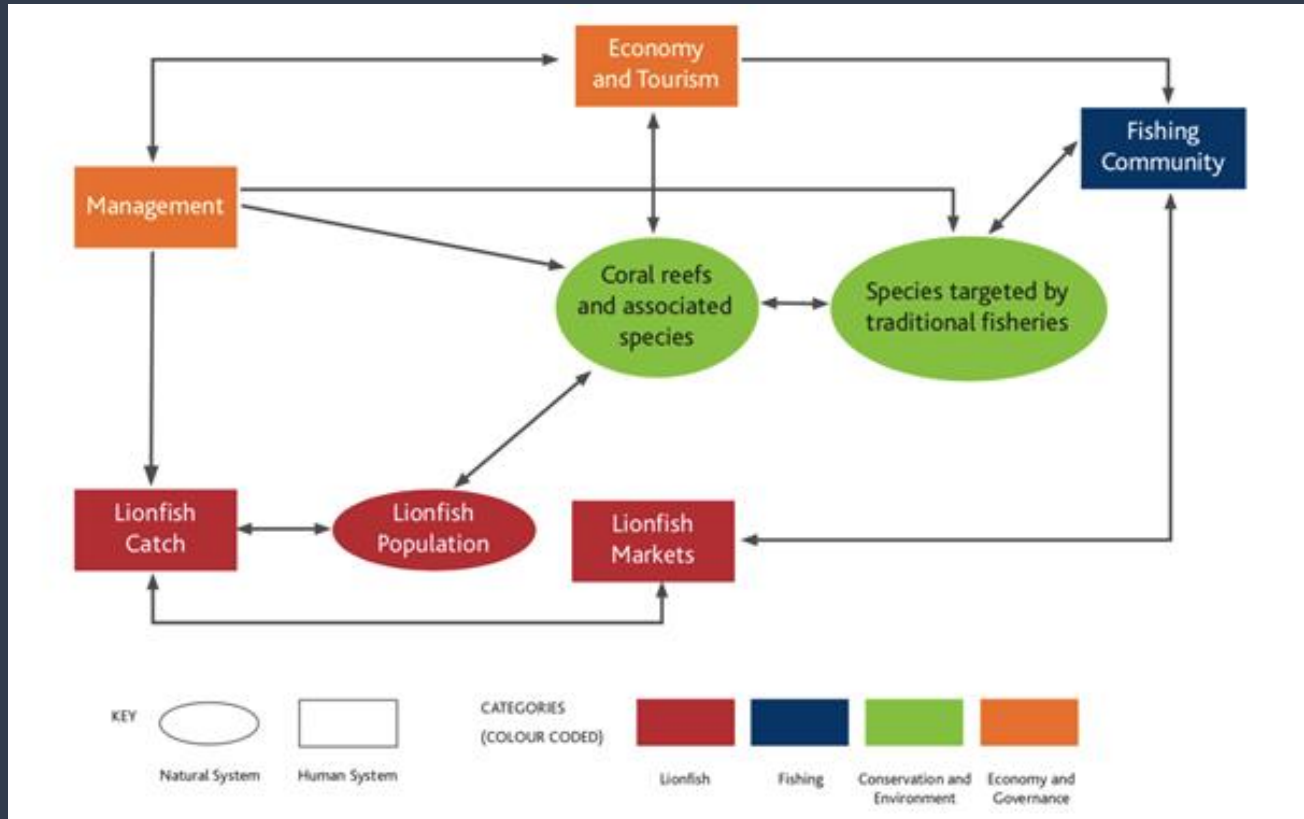
## ***Vision***

Adaptively managing lionfish in a participatory manner, to protect and improve livelihoods of all Belizeans and the health of Belize's marine environment.

## ***Key objective***

A key objective of this strategy is to develop a long-term community-led monitoring program, responsible for guiding effective lionfish management, monitoring and evaluation efforts across Belize.

# Recognising the interconnectedness of the system



# \*2015 national priority assessment

PA, Management Entity & Managed Access area	Justification	Priority Level (low, med, high)
Southwater Caye Marine Reserve (SWCMR), Belize Fisheries Department: Managed Access Area 3	Based on 2015 survey results, had highest lionfish density.	high
Sapodilla Cayes Marine Reserve (SCMR), Belize Fisheries Department: Managed Access Area 4	Based on 2017 observations there were a lot of lionfish, but in 2019 sightings were low; gaps in knowledge exist for monitoring; little diving activity for Sap Cayes and this could mean little is an indication for increased presence of lionfish control is occurring	high
Caye Caulker Marine Reserve (CCMR), Belize Fisheries Department: Managed Access Area 1	Need more lionfish control in certain areas; 2015 surveys showed areas exist with high and low lionfish counts	high
Bacalar Chico Marine Reserve (BCMR), Belize Fisheries Department: Managed Access Area 1	Need higher level of control of lionfish removal	high
Turneffe Atoll Marine Reserve (TAMR), Turneffe Atoll Sustainability Association: Managed Access Area 6	An existing gap, previous studies have indicated high numbers; possibility that no-take-zones have high numbers of lionfish; general-use-zones also need to be surveyed for comparison	high
Gladden Spit & Silk Cayes Marine Reserve, Southern Environmental Association: Managed Access Area 3	Juvenile sightings are high especially in whale shark zone (phase I & III); 2014 baseline data exists with SEA and BV	high

2020+

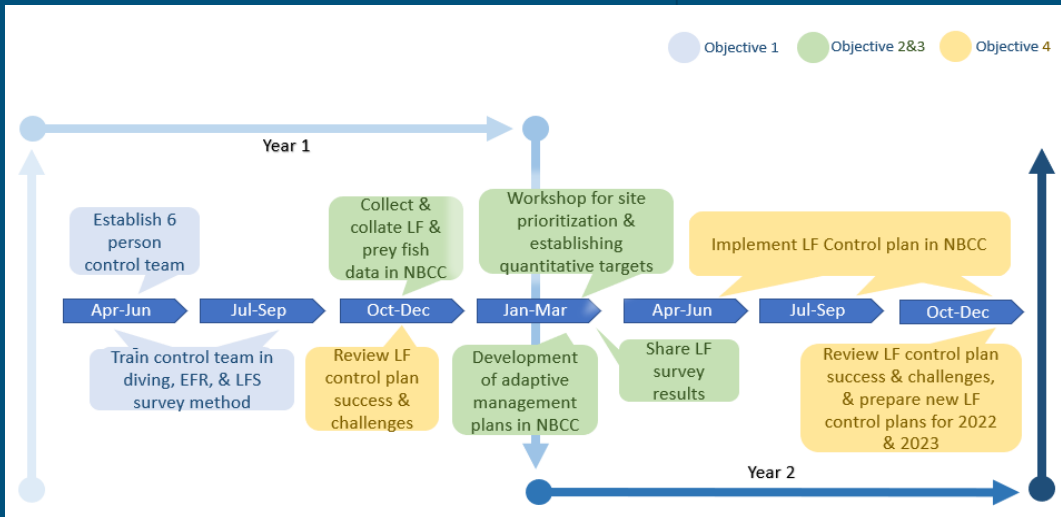
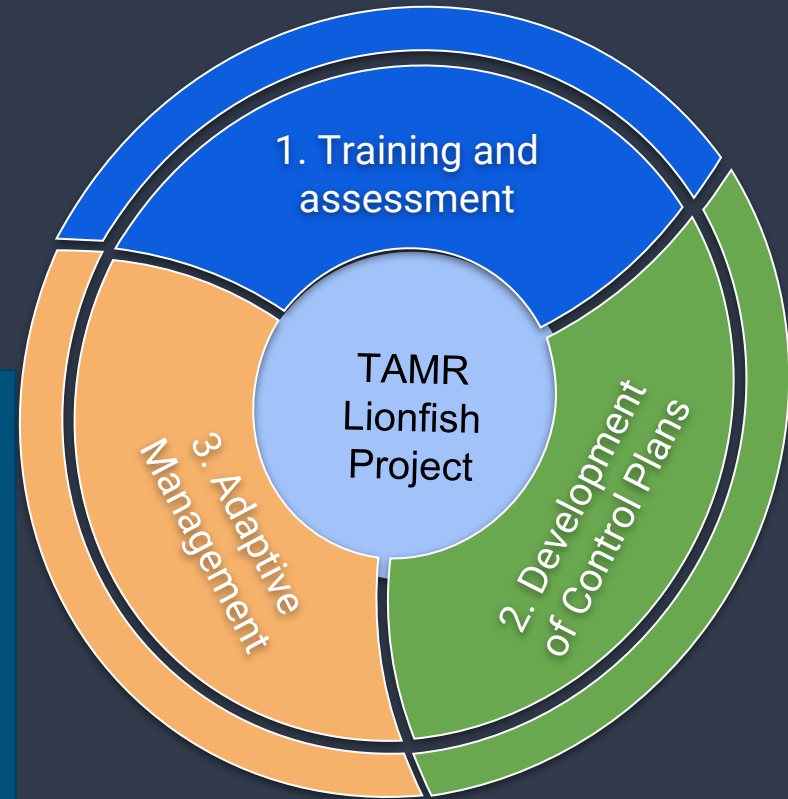
## Establishing effective lionfish management in Belize's fish replenishment zones

Support Belize MPA managers to establish a scalable model for effective and participatory lionfish adaptive management

Focus: capacity building, involving key stakeholders, & piloting an approach that can be replicated throughout the LAC region



# Project components & activities



# Training & capacity building

Since 2020, BV has trained 18 MPA staff and partners in:

- Lionfish Focused Search (LFS) survey methods
- Principles of lionfish monitoring and adaptive management
- Fish ID training
- PADI scuba certification
- Emergency First Response & First Aid



# Assessment

Updated population status surveys  
(LFS method) in 4 MPAs

- BCMR
- CCMR
- HCMR
- TAMR
- SWCMR (planned 2022)



# Established control plans with quantitative targets



## LIONFISH CONTROL PLAN

FOR TURNEFFE ATOLL  
MARINE RESERVE,  
BELIZE



MAY 2021



Lionfish Threshold Status

Over

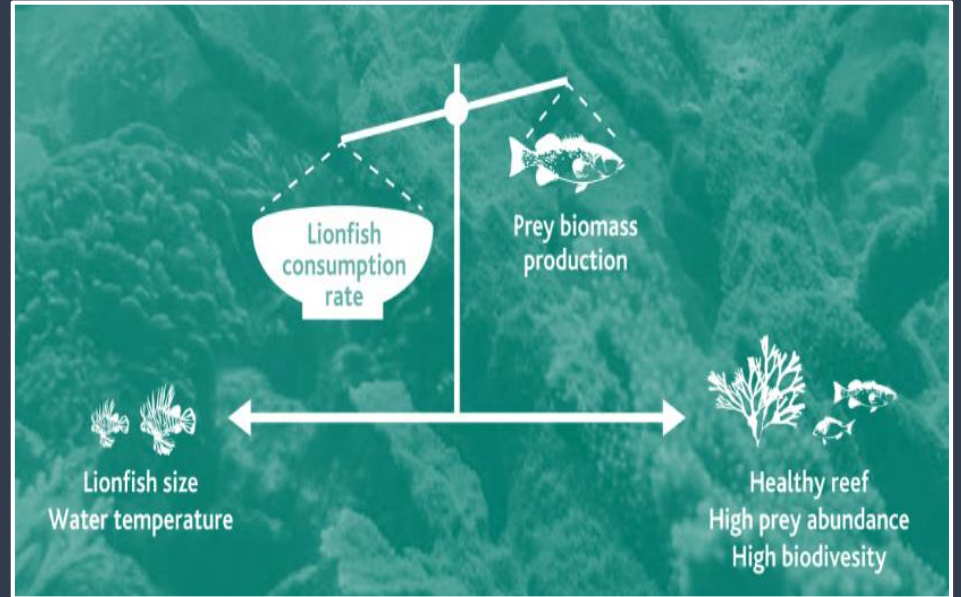
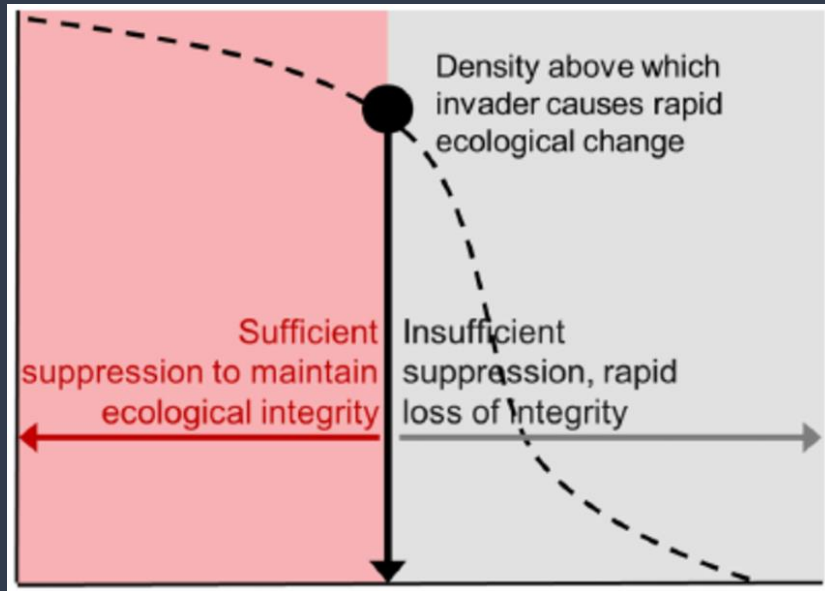
Near

Under

na

Null

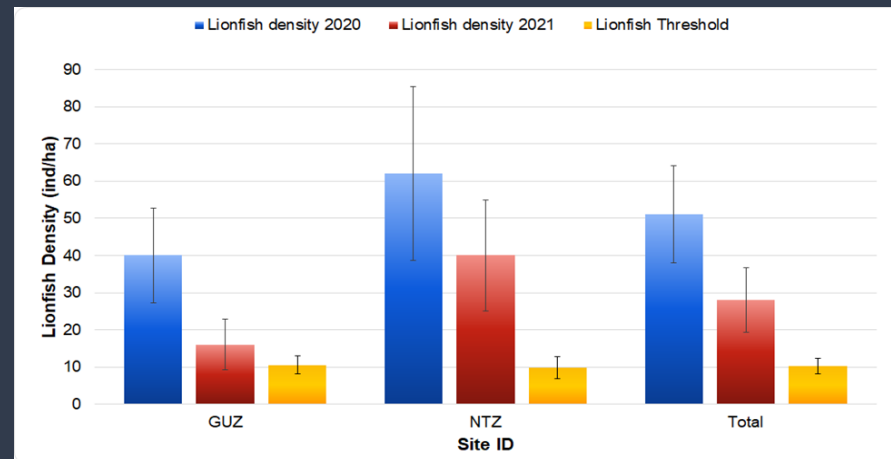
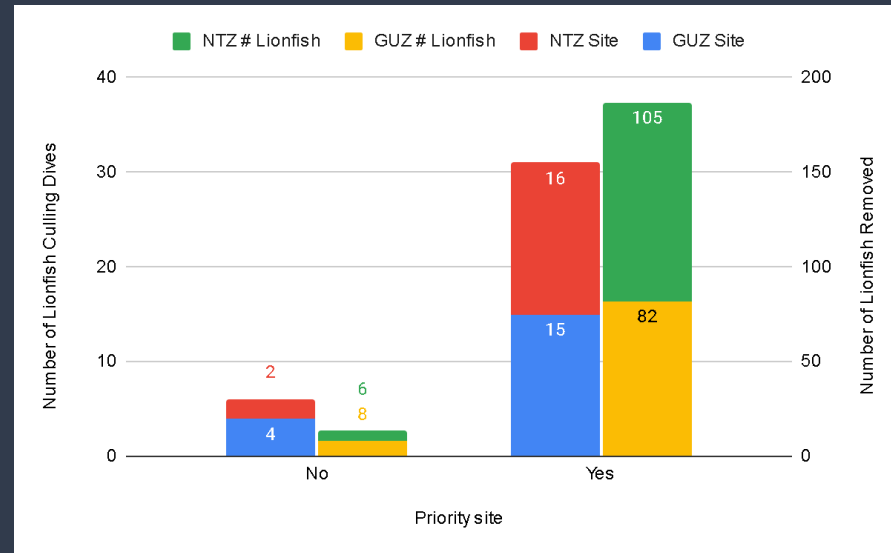
# Using Limits of Acceptable Change



*Green et al. (2014) Linking removal targets to the ecological effects of invaders: a predictive model and field test. Ecological Applications 24(6):1311-1322*

# Adaptive management: Turneffe Atoll

Indicators	2020	2021	Change
<i>Average Total Length (cm)</i>	22	21	↓
<i>Lionfish density (ind./ha)</i>	77	46	↓
<i>Threshold density (ind./ha)</i>	24	12	↓
<i>% sites exceeding threshold</i>	46	38	↓



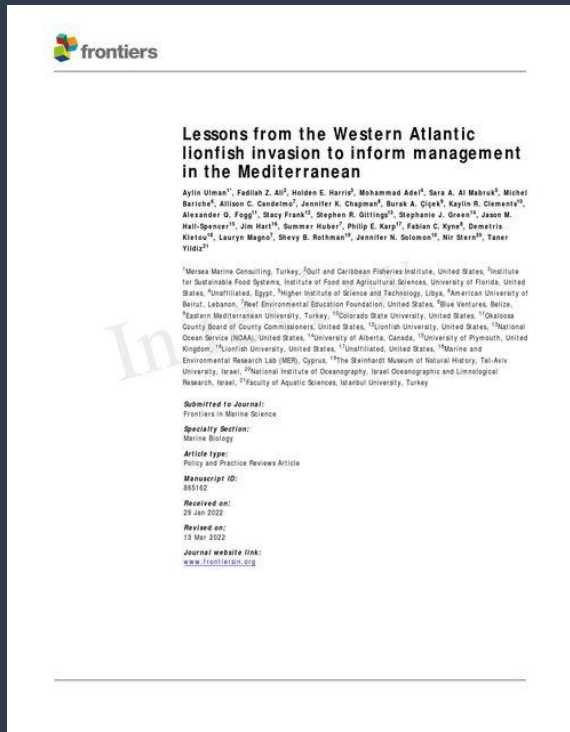
# Lessons learned

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- adapt to suit needs of MPA
- participatory & community led – policy for lionfish control in MPAs to support this (in prep)
- more emphasis on data sharing & feedback with communities
- LFS method resource intensive/expensive



# Target - LF control in 25% Belize's nearshore by 2024



## DO'S AND DON'TS OF LIONFISH MANAGEMENT



### PROMOTE LIONFISH HUNTING TOURISM

Helps support dive operators and tourism; divers need training and proper equipment.



### ALLOW HARVEST VIA SCUBA AND POLE SPEARS

Noncompliance can be mitigated by gear use restrictions and working with stakeholder groups.



### ENCOURAGE RECREATIONAL TOURNAMENTS

Derbies provide a participatory approach to conduct removals, research, and public education.



### ENCOURAGE COMMERCIAL MARKETS

Develop market-based solutions to control lionfish densities and diversify fishers' catches.



### ENCOURAGE PARTICIPATORY MANAGEMENT

Stakeholder engagement can support removals, market building, and strategic planning.



### COORDINATE REGIONAL MANAGEMENT

Biological invasions require rapid and strategic management approaches with multinational cooperation.



### DON'T RELY ON "BOUNTY" PROGRAMS

Funds can be quickly exhausted. Sustainable control is better achieved by improving education, stakeholder engagement, and lionfish fisheries.



### DON'T "TRAIN" NATIVE PREDATORS

Feeding speared lionfish to predators results in aggressive behavior by them towards divers.



thewaterloofoundation\*



# Thank you!



Turneffe Atoll  
Sustainability Association

blue ventures  
beyond conservation

[www.blueventures.org](http://www.blueventures.org)