

Decades of Dedication: Fish Spawning Aggregation Research in the Florida Keys



Presented by: Danielle Morley
Florida Fish and Wildlife Commission
South Florida Regional Lab

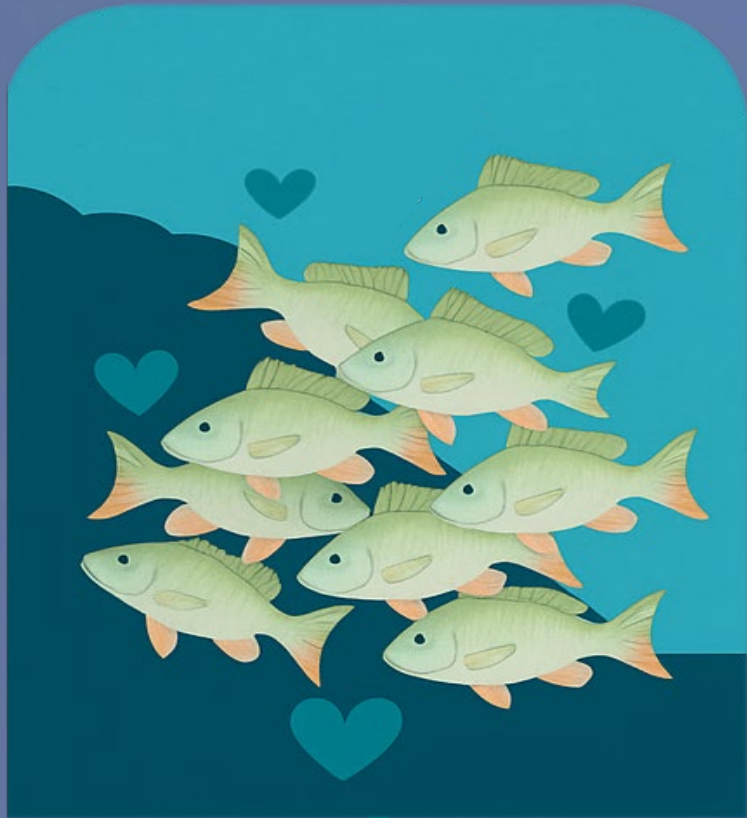


FLORIDA KEYS

MARINE SCIENCE CONFERENCE & WORKSHOP

October 27-30, 2025

Coral Springs, FL



70 Kilometers

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus



Google Maps

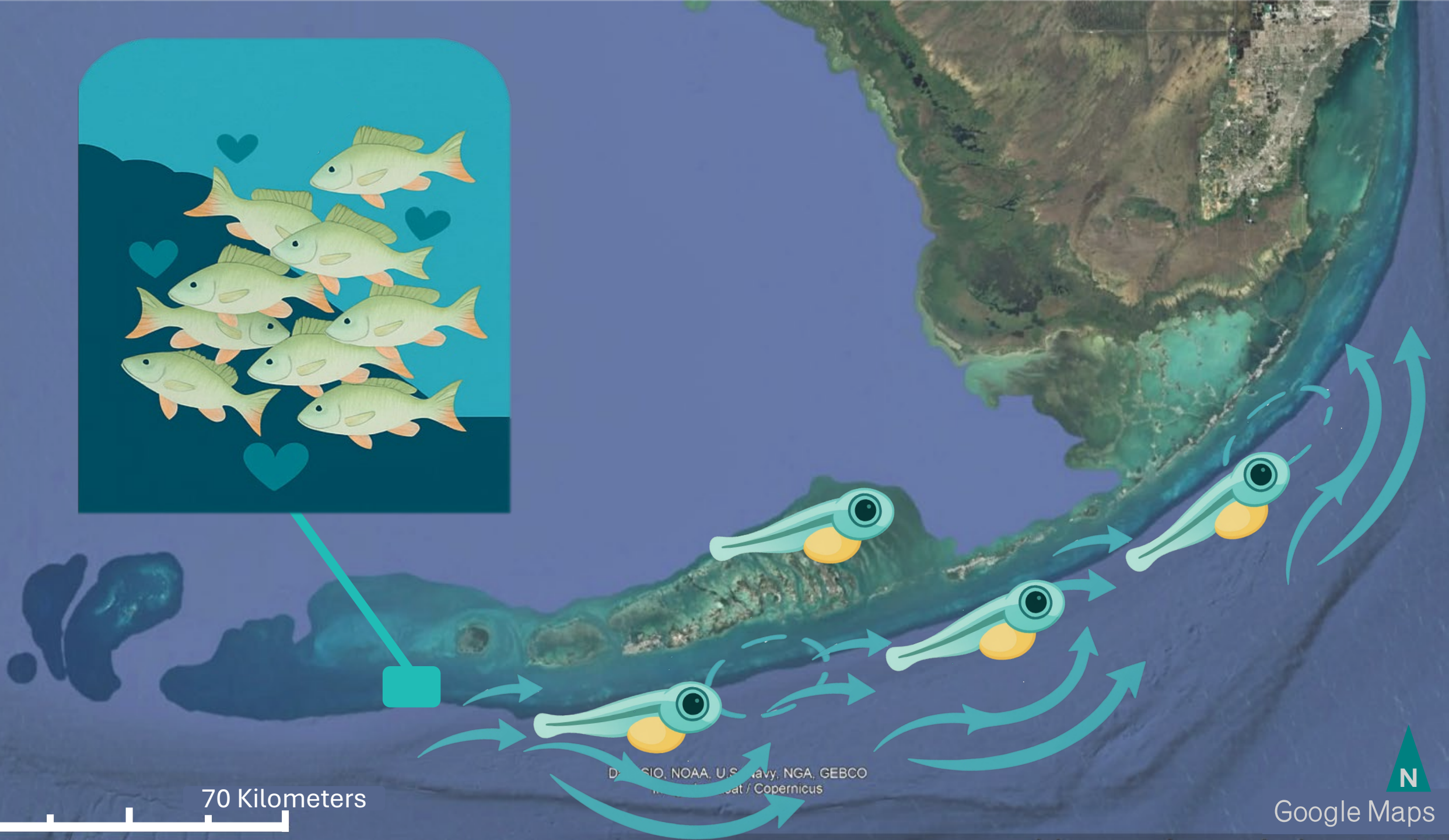
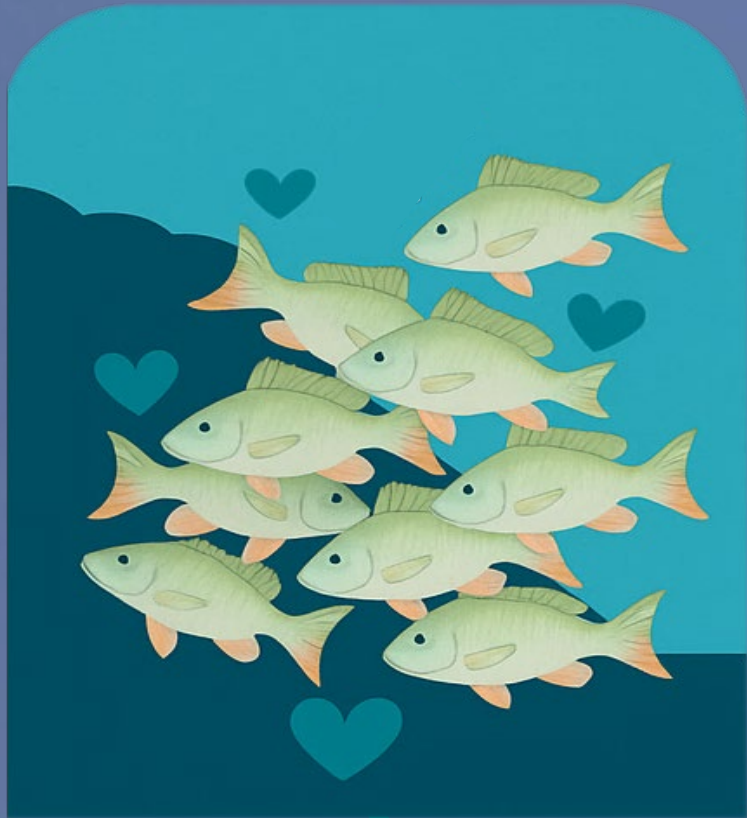


70 Kilometers

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus



Google Maps



DATA SIO, NOAA, U.S. Navy, NGA, GEBCO
Imagery © 2021 Google / Copernicus

70 Kilometers



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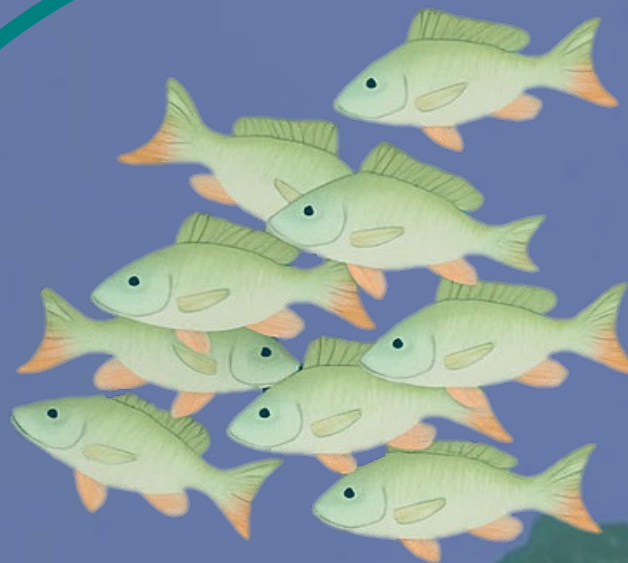
**Fisheries
Management**

**Recruitment
Success**

**Population
Resilience**

**Energy/Nutrient
Cycling**

**Sustainable
Harvest**



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus

70 km

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Peak spawning months

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mutton snapper												
Gray snapper												
Cubera snapper												
Black grouper												
Nassau grouper												
Yellowfin grouper												
Goliath grouper												
Red hind												
Atlantic tarpon												
Permit												
Greater amberjack												
Bonefish												

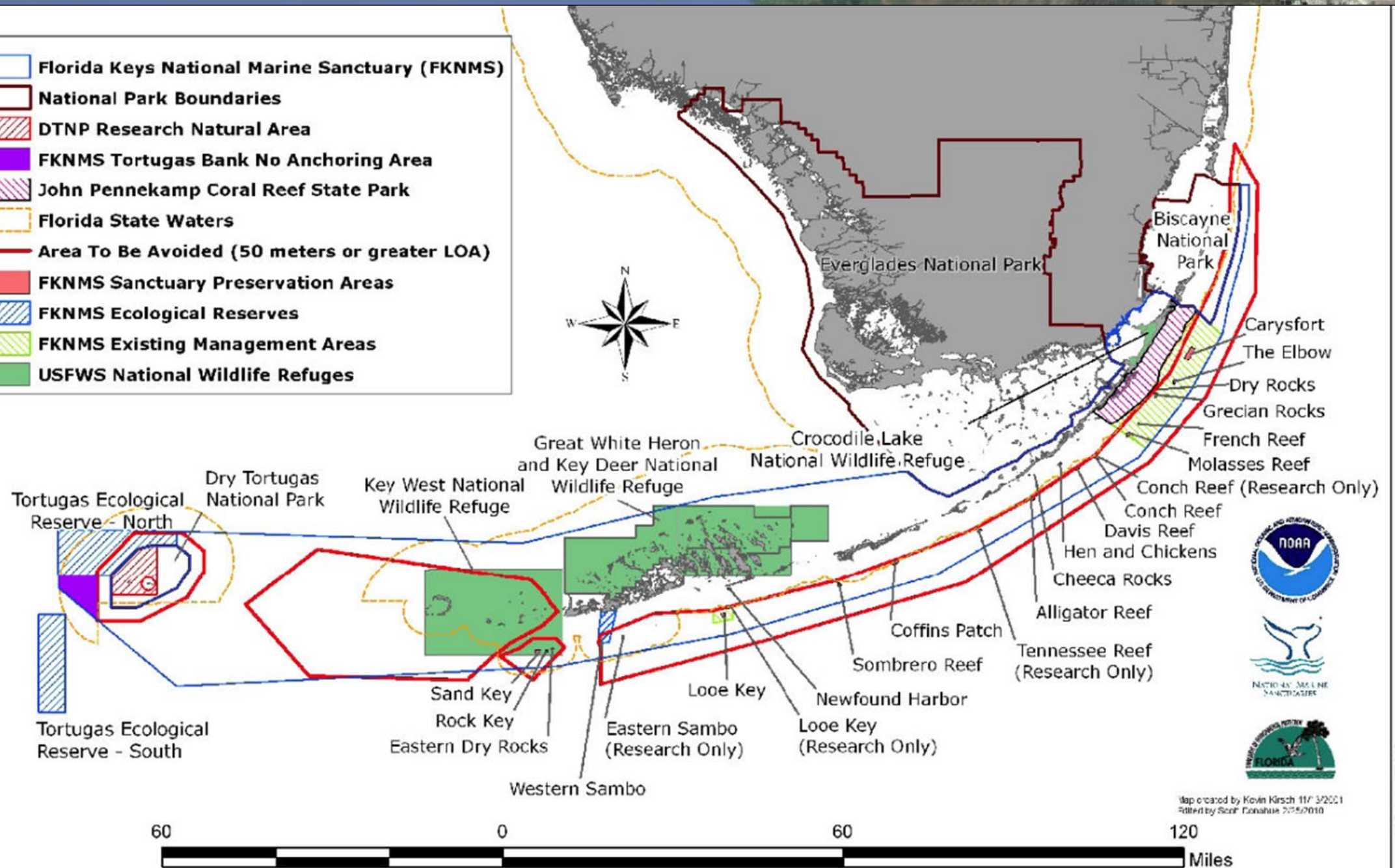
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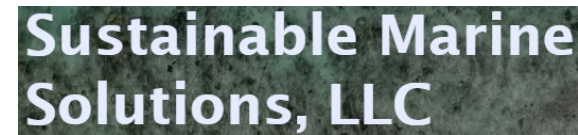
Google Maps

-  Florida Keys National Marine Sanctuary (FKNMS)
-  National Park Boundaries
-  DTNP Research Natural Area
-  FKNMS Tortugas Bank No Anchoring Area
-  John Pennekamp Coral Reef State Park
-  Florida State Waters
-  Area To Be Avoided (50 meters or greater LOA)
-  FKNMS Sanctuary Preservation Areas
-  FKNMS Ecological Reserves
-  FKNMS Existing Management Areas
-  USFWS National Wildlife Refuges



Who we are:

Alejandro Acosta, Aaron J. Adams, Joel W. Bickford, Benjamin M. Binder, Kevin M. Boswell, Ross E. Boucek, Jacob W. Brownscome, Sarah Burnsed, Michael L. Burton, Laurent M. Cherubin, Gina Clementi, Steven J. Cooke, Andy J. Danylchuk, Erik Ebert, Michael W. Feeley, Kirk Gastrich, Lucas P. Griffin, Samantha R. Hagedorn, Michael Heithaus, William D. Heyman, Jessica A. Keller, G. Todd Kellison, James V. Locascio, Susan K. Lowerre-Barbieri, Roldan C. Muñoz, Jack C. Olson, Jessica A. Robichaud, Noah A. Reiser, Timothy J. Rowell, Jesse J. Secord, J. Christopher Taylor and Kara Wall



1990s – Building the Foundation

1990



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**1990 - Florida Keys National
Marine Sanctuary Established**

1990



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N

Google Maps

1990 - Florida Keys National Marine Sanctuary Established

1990

During the 1990s

Lindeman et al. interview fishers including Peter Gladding and Don DeMaria

BULLETIN OF MARINE SCIENCE, 66(3): 929-956, 2000

DEVELOPMENTAL PATTERNS WITHIN A MULTISPECIES
REEF FISHERY: MANAGEMENT APPLICATIONS FOR
ESSENTIAL FISH HABITATS AND PROTECTED AREAS

Kenyon C. Lindeman, Roger Pugliese, Gregg T. Waugh and Jerald S. Ault

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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70 Kilometers

1990 - Florida Keys National Marine Sanctuary Established

1999 - Diver surveys begin at **Riley's Hump**

1990

During the 1990s

Lindeman et al. interview fishers including Peter Gladding and Don DeMaria

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2000s – Protection and Early Research

2000



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2001 - **Riley's Hump** protected
inside Tortugas South Reserve

2000



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Google Maps

2001 - **Riley's Hump** protected
inside Tortugas South Reserve

2000

2004 - Domeier publishes larval
pathway from **Riley's Hump**



A potential larval recruitment pathway originating from a Florida marine protected area

Michael L. Domeier ✉

First published: 26 August 2004 | <https://doi.org/10.1111/j.1365-2419.2004.00287.x> | Citations: 30

70 Kil

2001 - **Riley's Hump** protected
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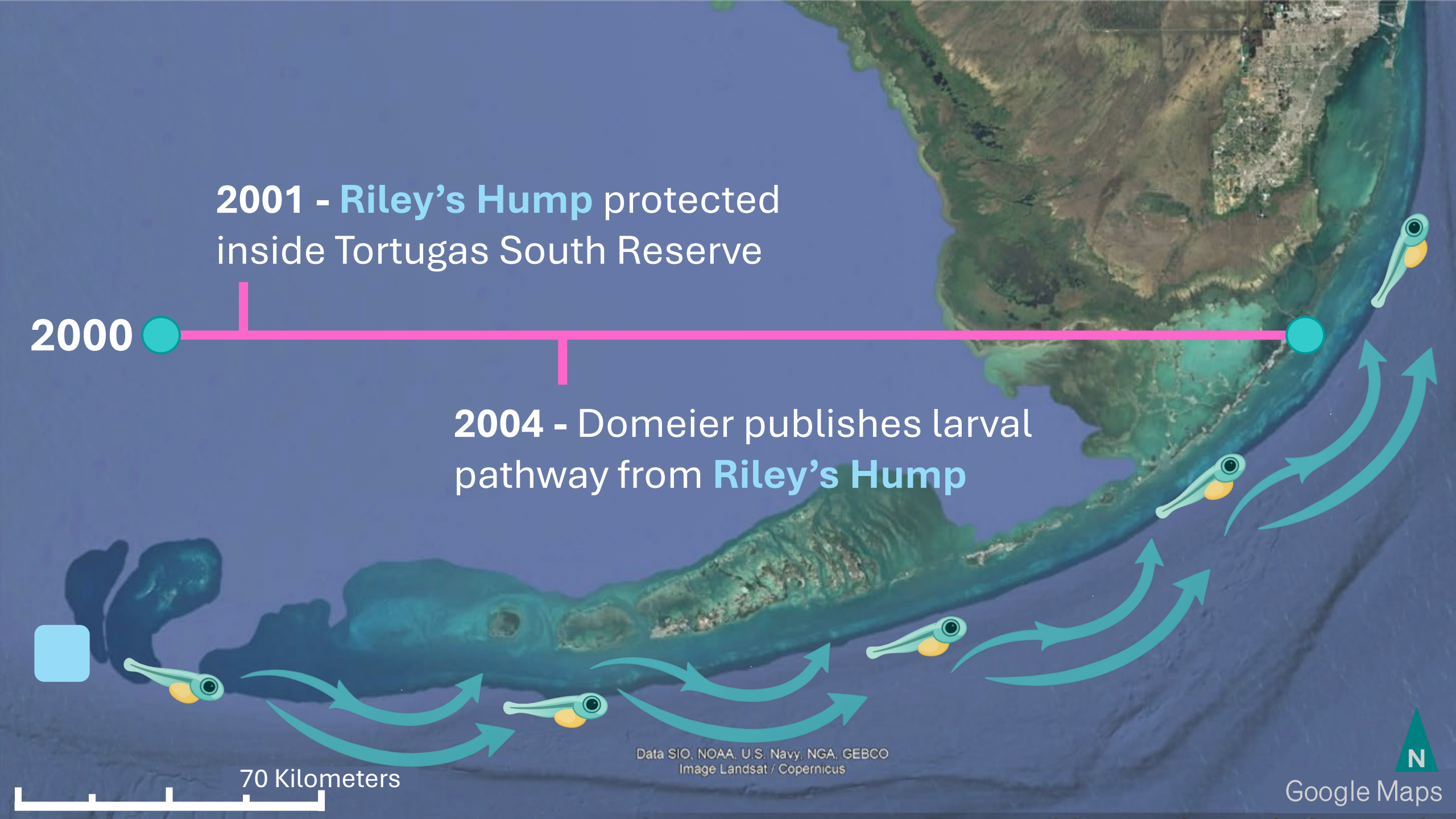
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70 Kilometers

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus

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N



2001 - **Riley's Hump** protected
inside Tortugas South Reserve

2008 - Research expands
at **Riley's Hump**

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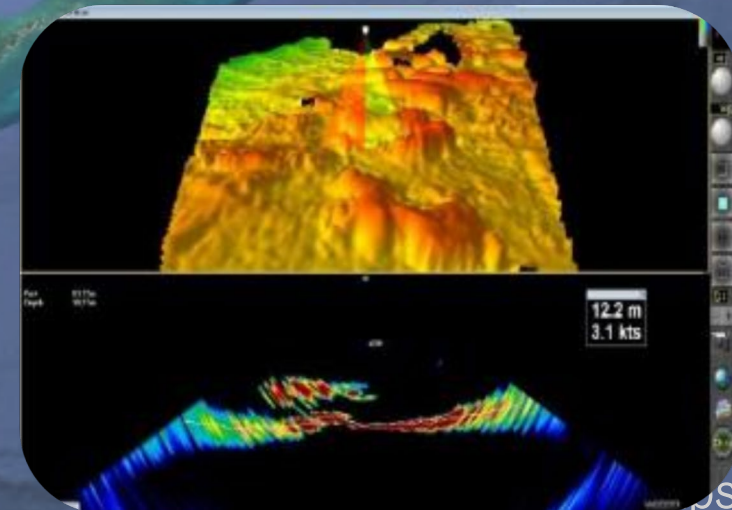
2008 - Research expands
at **Riley's Hump**

2000

2004 - Domeier publishes larval
pathway from **Riley's Hump**



70 Kilometers



2000

expands



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus

70 Kilometers



Google Maps

A map of the Florida Keys is shown with a pink horizontal timeline line. The timeline starts at the western end of the keys and moves eastward. Key events are marked with vertical pink lines and text. Riley's Hump is highlighted in light blue on the map. Green squares are placed along the timeline to indicate specific locations or periods of research. The text is as follows:

- 2000** (marked with a teal circle)
- 2001** - Riley's Hump protected inside Tortugas South Reserve
- 2004** - Domeier publishes larval pathway from Riley's Hump
- 2008** - Research expands at Riley's Hump
- 2009** - Research expands



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus



70 Kilometers

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2010s – Integration and Tech Growth

2010



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2010

2010 - Passive
acoustic monitoring
at **Riley's Hump**,
aerial surveys



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Google Maps

2012 - Targeted
research at **Western
Dry Rocks (WDR)**

2010

2010 - Passive
acoustic monitoring
at **Riley's Hump**



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2012 - Targeted
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2010 - Passive
acoustic monitoring
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2014 - Acoustic
telemetry **WDR**



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2012 - Targeted
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2010 - Passive
acoustic monitoring
at **Riley's Hump**

2014 - Acoustic
telemetry **WDR**

2015 - Research
expands to deeper water

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FLORIDA

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2012 - Targeted research at **Western Dry Rocks (WDR)**

2016 – More tech at **Riley's Hump**, partners study tarpon

2010

2010 - Passive acoustic monitoring

2014 – Acoustic



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Harbor Branch
Oceanographic Institute



2012 - Targeted research at **Western Dry Rocks (WDR)**

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2010 - Passive acoustic monitoring at **Riley's Hump**

2014 - Acoustic telemetry **WDR**

2015 - Research expands to deeper water



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70 Kilometers

N
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2012 - Targeted research at **Western Dry Rocks (WDR)**

2016 - More tech at **Riley's Hump**, partners study tarpon

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2010 - Passive acoustic monitoring at **Riley's Hump**

2014 - Acoustic telemetry **WDR**

2015 - Research expands to deeper water

2017 - **Warsaw Hole** becomes protected FSA

70 Kilometers

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Google Maps

2018 – Further expansion of partners and technology (WDR)

2017 – Warsaw Hole becomes protected FSA

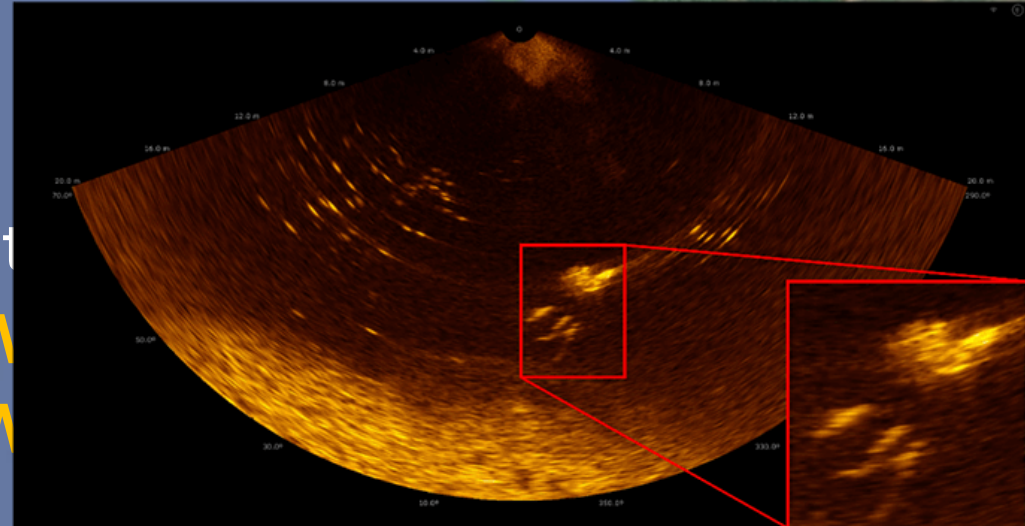
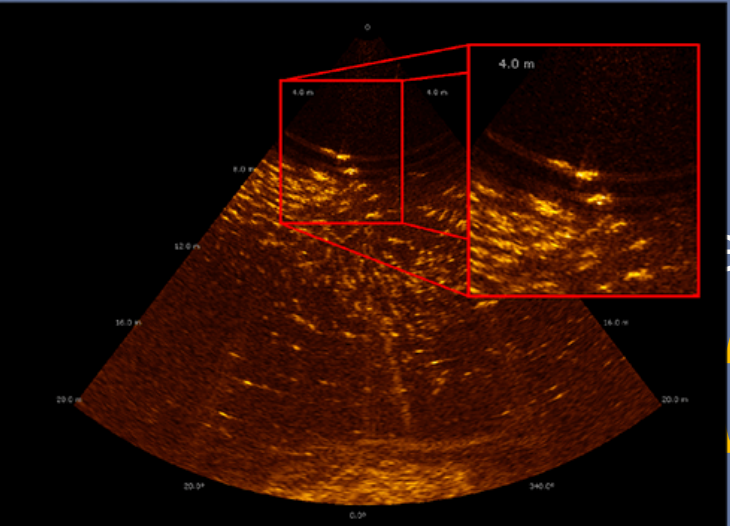
2015 - Research expands to deeper water

Acoustic try WDR



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2010



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2020s – Present and Outcomes

2020



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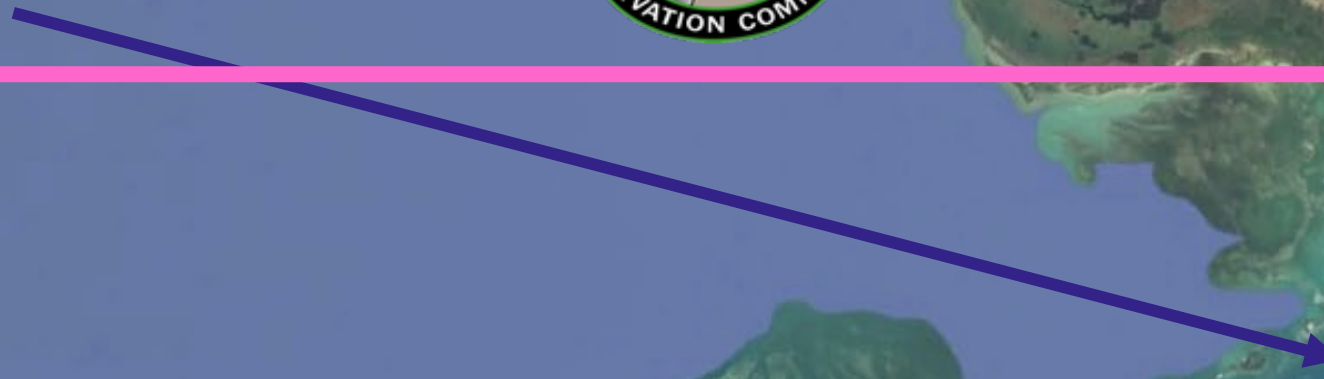


Google Maps

2021 - Expansion of
FSA research



2020



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Google Maps

2021 - Expansion of
FSA research

2020

2021 - **WDR** becomes
seasonal closure



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2020

2021 - Expansion of
FSA research

2021 - **WDR** becomes
seasonal closure

2025 - Pre-spawning bonefish
aggregation receives
protection near Biscayne Bay



70 Kilometers

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Image Landsat / Copernicus

2020

2021 - Expansion of
FSA research

2021 - **WDR** becomes
seasonal closure

2025 - Pre-spawning bonefish
aggregation receives
protection near Biscayne Bay

2028 - FWC review of
management at **WDR**



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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There are still challenges

-  Riley's Hump – **protected since 2001**
-  NOAA/FWC
-  University of Florida/FWC (ongoing)
-  Bonefish Tarpon and Trust, Carleton University,
University of Massachusetts - Amherst
-  Warsaw Hole – snapper/grouper **protection since 2017**
-  Western Dry Rocks- **protection since 2021**
-  Bonefish pre-spawning - **protection since 2025**



70 Kilometers

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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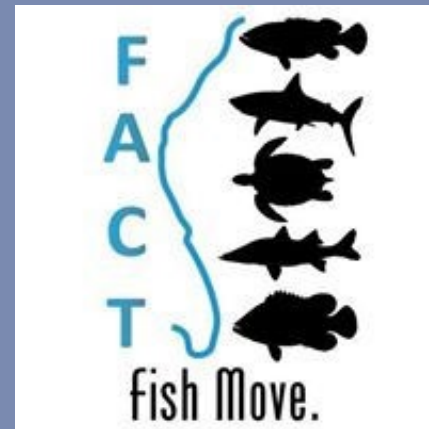
With challenges come opportunities



With challenges come opportunities

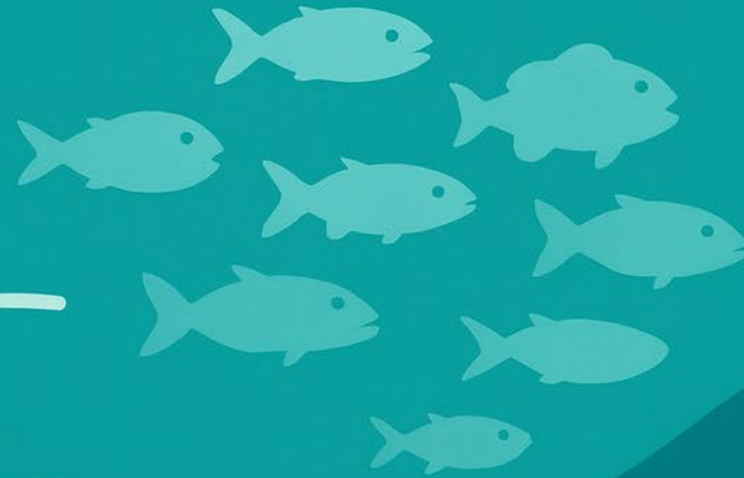


For acoustic telemetry data:





INCREASING
WATER TEMPERATURES

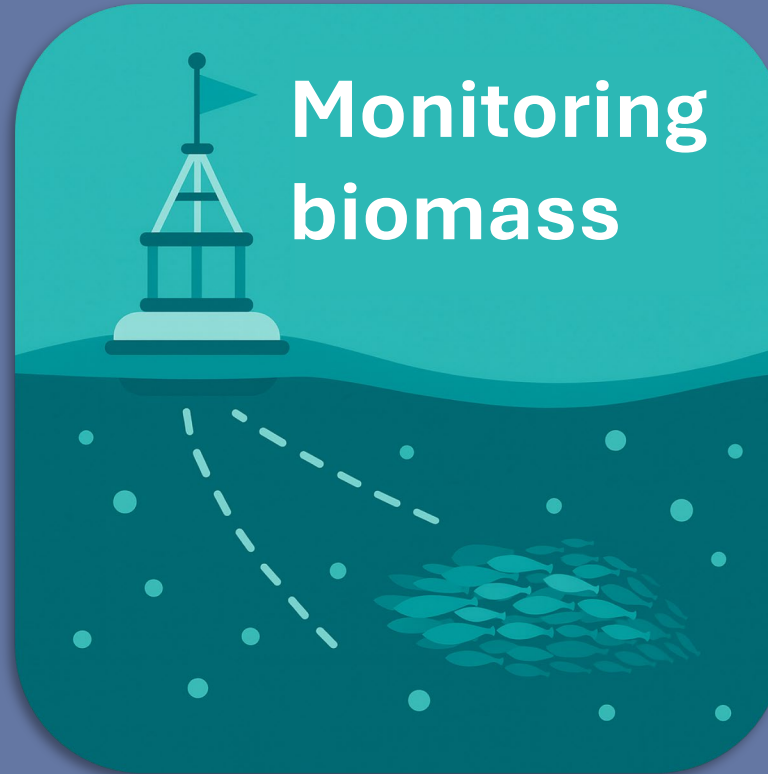


HABITAT
DEGRADATION



PHENOLOGICAL SHIFTS FOR
AGGREGATING FISH SPECIES

Future research opportunities



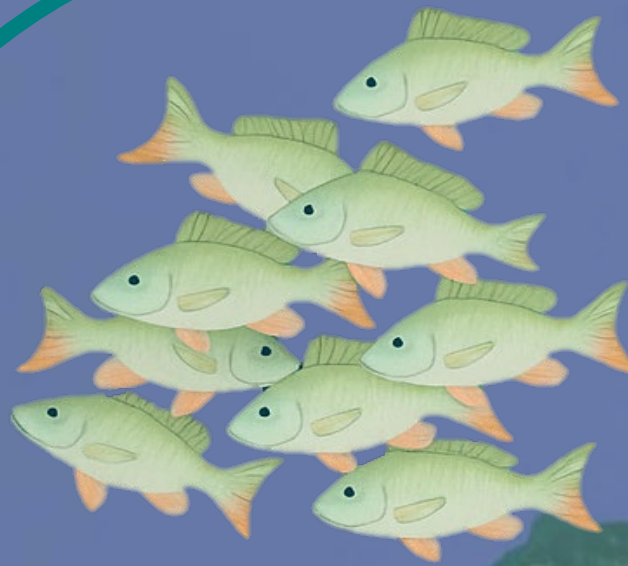
**Fisheries
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Because meaningful progress requires collective effort:

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