



# A Visual History of Florida's Coral Reefs Through Data



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## Introduction

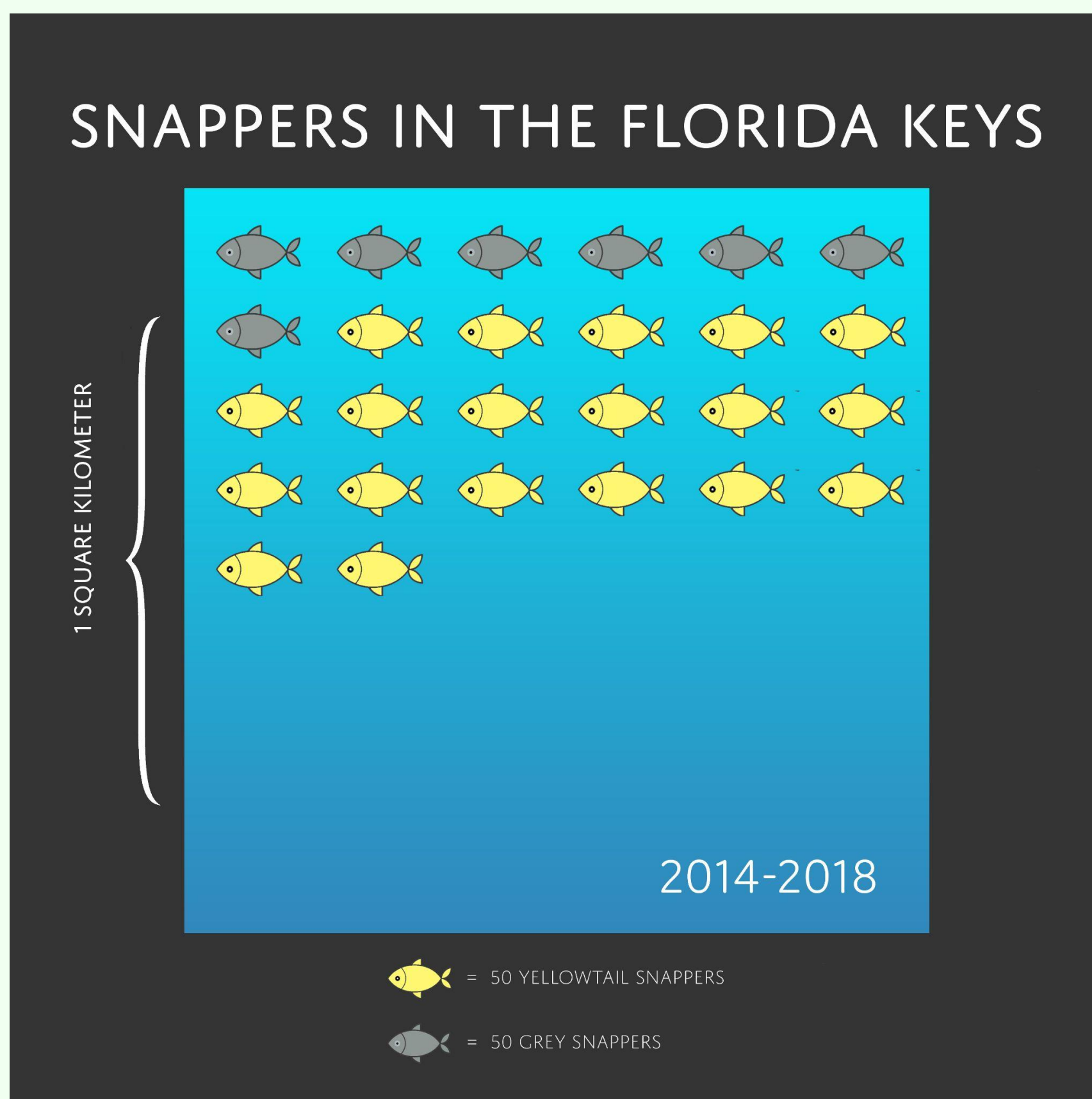
The National Oceanic and Atmospheric Administration's Coral Reef Conservation Program draws upon many different areas of research and knowledge on the coral-centered ecosystems of North America in order to optimize our interactions with the environment.

I had the privilege of working remotely with Zachary Mason a NOAA Data and Information Management Specialist, to analyze trends in fish species data mainly in the Florida Keys and the Dry Tortugas. We wanted to potentially investigate the effect of Marine Protected Areas and also communicate recent species trends to the general public.

**Database:** [grunt.sefsc.noaa.gov/rvc\\_analysis20/](http://grunt.sefsc.noaa.gov/rvc_analysis20/)



Working remotely



A frame from one of the animations - Snapper Density in the Florida Keys per Square Kilometer

## Methods:

We used the RVC fish database, which contained data that was collected by the Southeast Fisheries Science Center, who has conducted visual surveys of fish species since 1979, and the years after 1999 were available in the database. There are measures of species size, location, and population.

I worked remotely with Zach and Jeremiah Blondeau, the database manager, to analyze trends in fish species data mainly in the Florida Keys and the Dry Tortugas using RStudio. Our main focus was the density, measured in average fish per square kilometer, of certain species. Divers took visual surveys of "cylinders" and counted the number of fish in each one. These were averaged out for each species and region. In particular we wanted to see what recent trends looked like for

- Black Groupers
- Red Groupers
- Mutton Snappers
- Yellowtail Snappers
- Hogfish

Towards the end of the year, we started producing animations using Adobe Photoshop that showed trends in the density using four stages of time. Our goal was to be able to produce graphics that would effectively communicate patterns to children still in grade school.

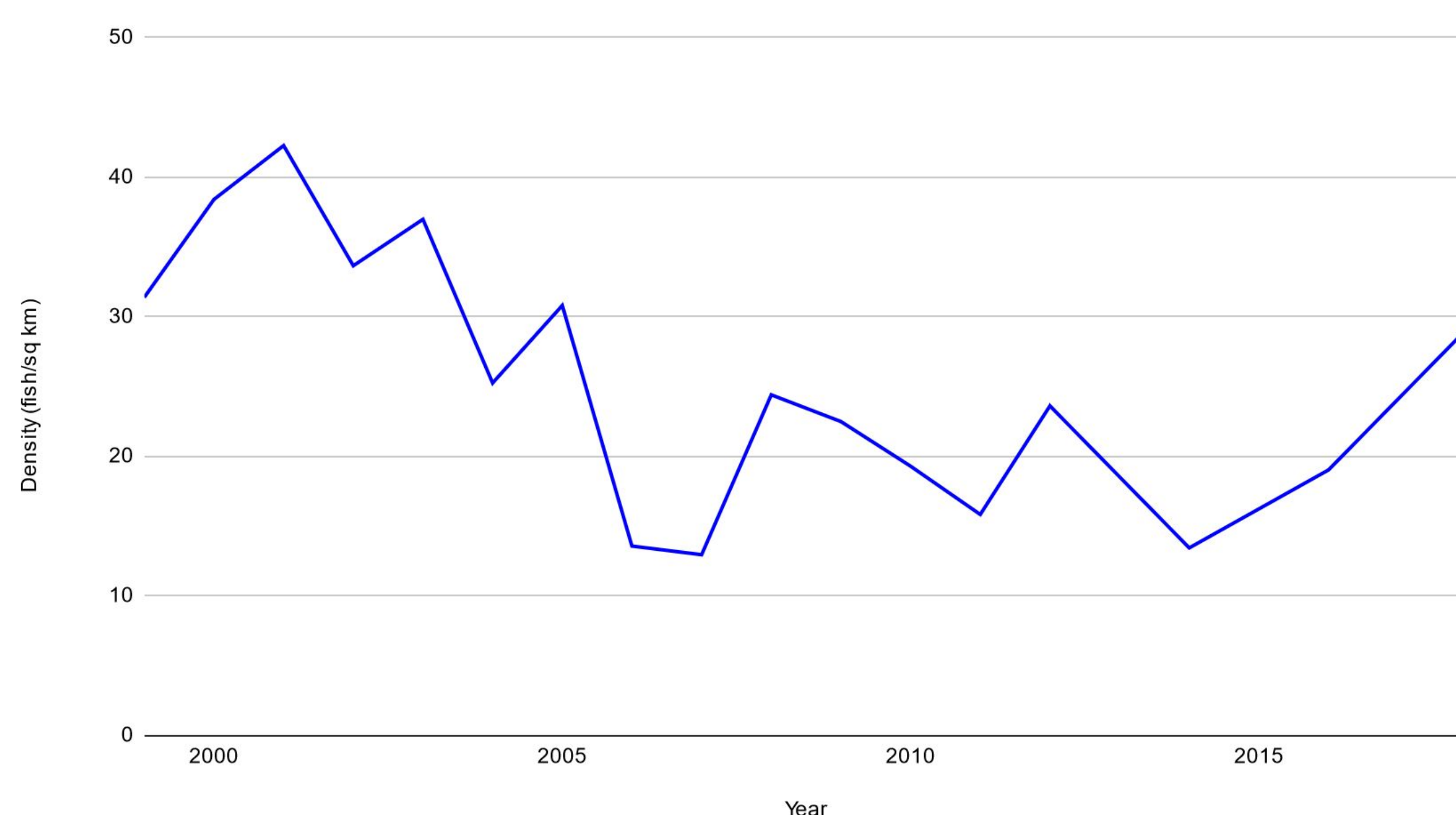
## Results:

- Black Groupers
  - -20% in Florida Keys
  - -73% in Dry Tortugas
- Red Groupers
  - -7% in Florida Keys
  - -26% in Dry Tortugas
- Mutton Snappers
  - +410% in Florida Keys
  - +53% in Dry Tortugas
- Yellowtail Snappers
  - +83% in Florida Keys
  - +153% in Dry Tortugas
- Hogfish
  - +117% in Florida Keys
  - -20% in Dry Tortugas

## Interpretation:

- Groupers have declined since 1999 - most are slowly recovering but numbers in Dry Tortugas are still dropping
- Snappers have exploded - which began around 2005 - 2008 and has continued ever since
- Hogfish overall have slightly increased
- For a good amount of species, we see a trend similar to the one on the left, where numbers dropped and are starting to recover recently

Black Grouper Density (fish/sq km) per Year in Florida Keys



Black Grouper Density in the Florida Keys

## Takeaway:

There are lots of contextual pieces of information that can explain certain trends that appeared in the data. Protected areas and fishing regulations have changed frequently in the last 20 years, and we are seeing those effects now. Marine Protected Areas came into effect in the late 1990s and early 2000s when they really started to gain traction in the public. Unfortunately, it seems that their effect began to wear off and restrictions were taken less seriously. The recent surge back for some species will be interesting to track.

## Biggest Challenge:

I began doing analysis on the abundance of different species, not density, and about halfway through the year, in a meeting with Jeremiah, we discovered that density was a more accurate representation of population size. It was discouraging to have to start almost from scrap, but it was important that we used the right metric.

## Acknowledgements:

I would like to extend a large thank you to Zach Mason for giving me the opportunity to work with him this year and learn about how we can use data to tell a story. And of course thank you to Dr. Holtz and Dr. Merck for encouraging me and all my peers to pursue opportunities such as these and build solid foundations for our careers.



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