Fantastic Fish and Where to Find Them

(in North Carolina)

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Research Question!

How does the size of fish caught in North Carolina depend on fishing mode and distance from shore, and where in the state are the largest and rarest species actually found?

We aim to identify geographic patterns in fishing and explore how these patterns differ among fish species.

Datasets

iNaturalist observations

- Citizen science platform where users can upload pictures of wildlife they observed
- Contains data on species, location, and time

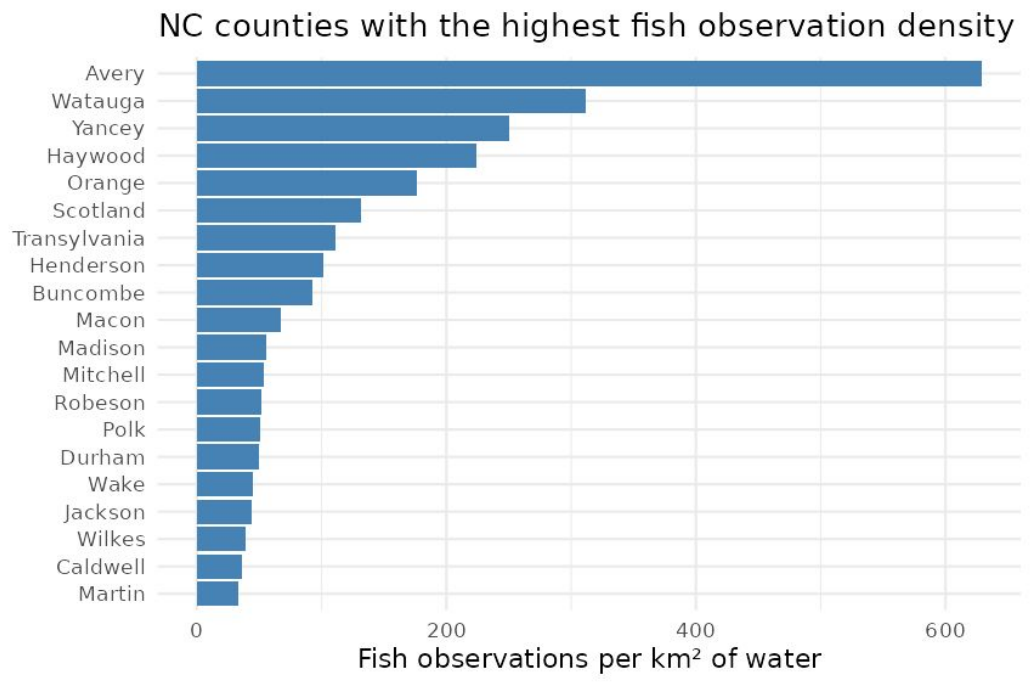


Marine Recreational Information Program (MRIP) 2025 Report

- Yearly report on marine recreational fishing by the NOAA
- Contains data on species, area, mode, and fish size



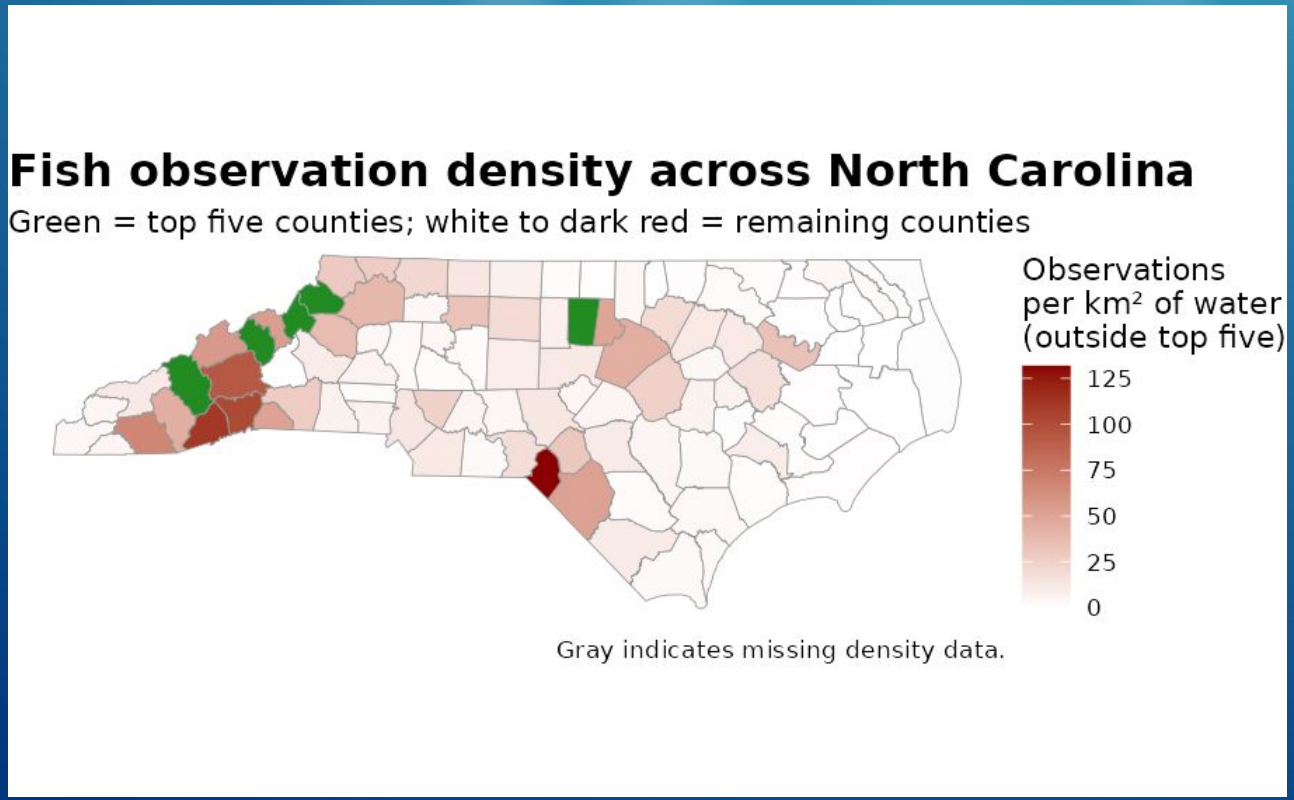
Where are fish observations most concentrated?



Key findings

- Avery County has the highest fish observation density, with approximately 650 observations per kmˆ2 of water.
- Avery County's observation density is roughly twice that of Watauga County.

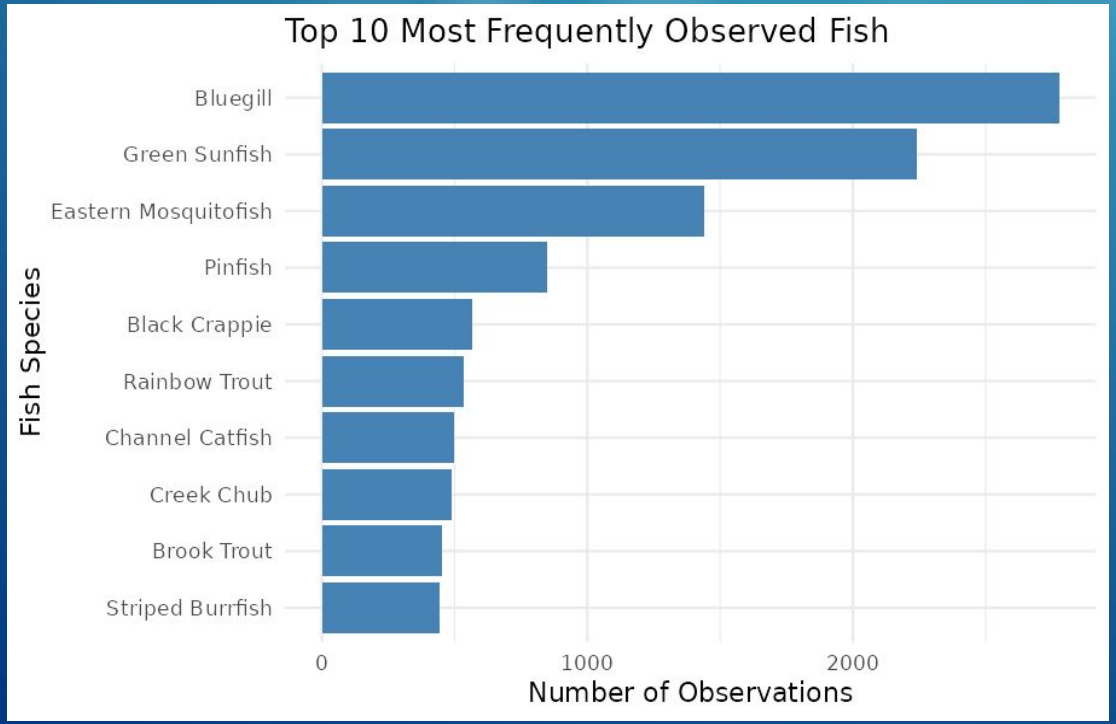
Geographic Patterns Across North Carolina



Key findings

- Four of the top five counties are located in western NC.
- Observation density varies geographically.

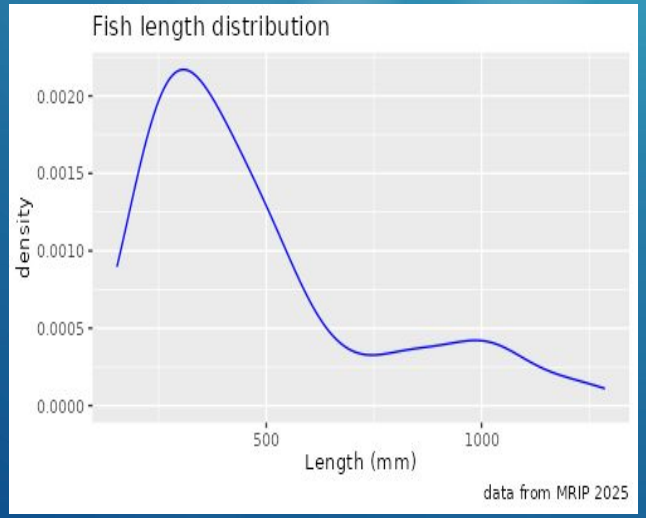
Do different fish species show different patterns?

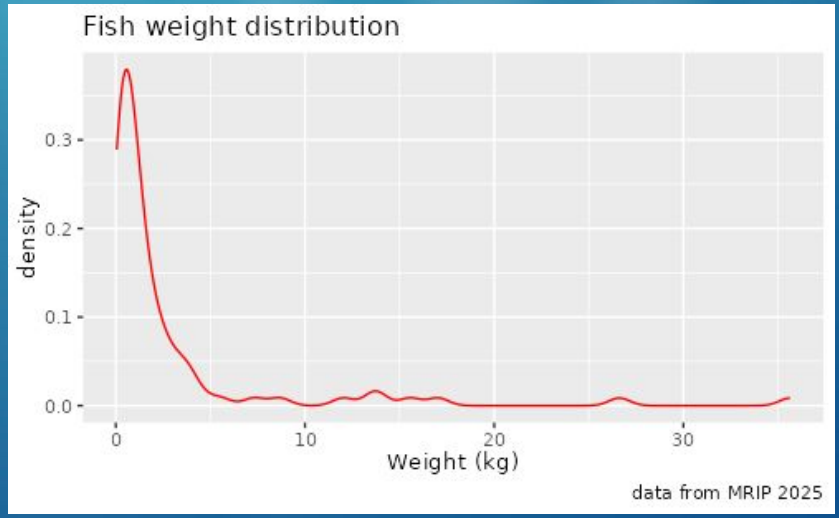


Key Findings

- Bluegill is the most frequently observed fish, with approximately 2800 observations.
- These differences reflect reported observations, not necessarily the actual population sizes of each species.

Finding the Largest Fish



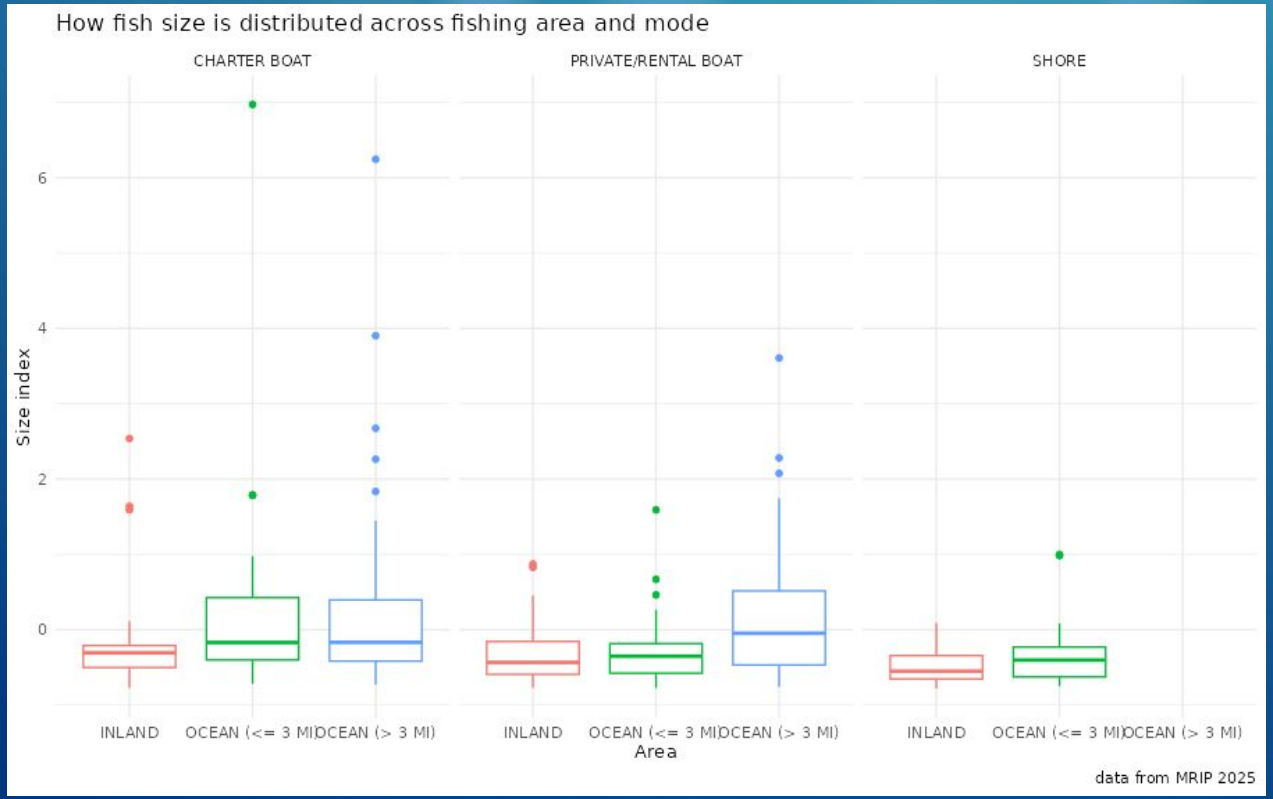


- Some long fish aren't heavy, some heavy fish aren't long
- Standardized measure of size
- Both charts are skewed to the right

$$I = \frac{1}{2}\left(\frac{L - \bar{L}}{s_L} + \frac{W - \bar{W}}{s_W}\right)$$

I : Size index
L : Average length per fish for a species
W : Average weight per fish for a species
$\bar{L}$: Mean of species average lengths across the dataset
$\bar{W}$: Mean of species average weights across the dataset
s_L : Standard deviation of species average lengths
s_W : Standard deviation of species average weights

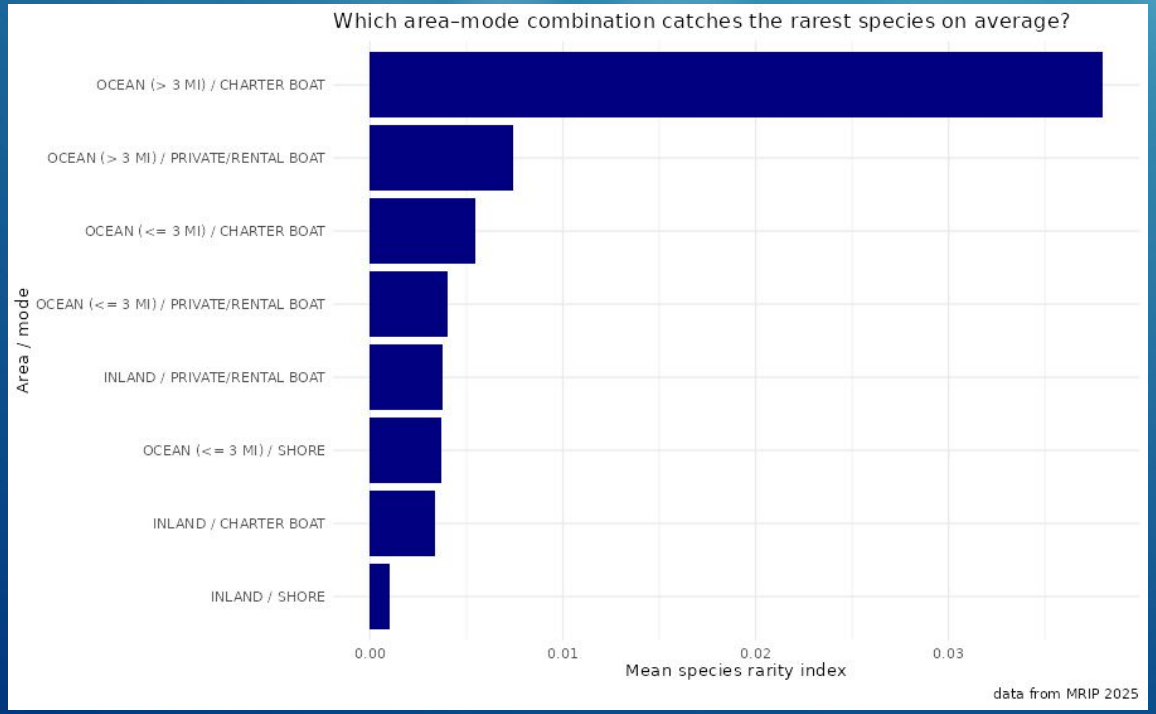
The Further off the Shore, the Bigger the Fish



Key findings

- Ocean beyond 3 miles has the highest median size index in every boat mode.
- Shore and inland fishing don't produce as much fish with large size index

Area-mode vs Species Rarity



Rarity index considers both landings and prevalence across area/mode

$$R = \frac{1}{\sqrt{N \times C}}$$

R : Rarity index

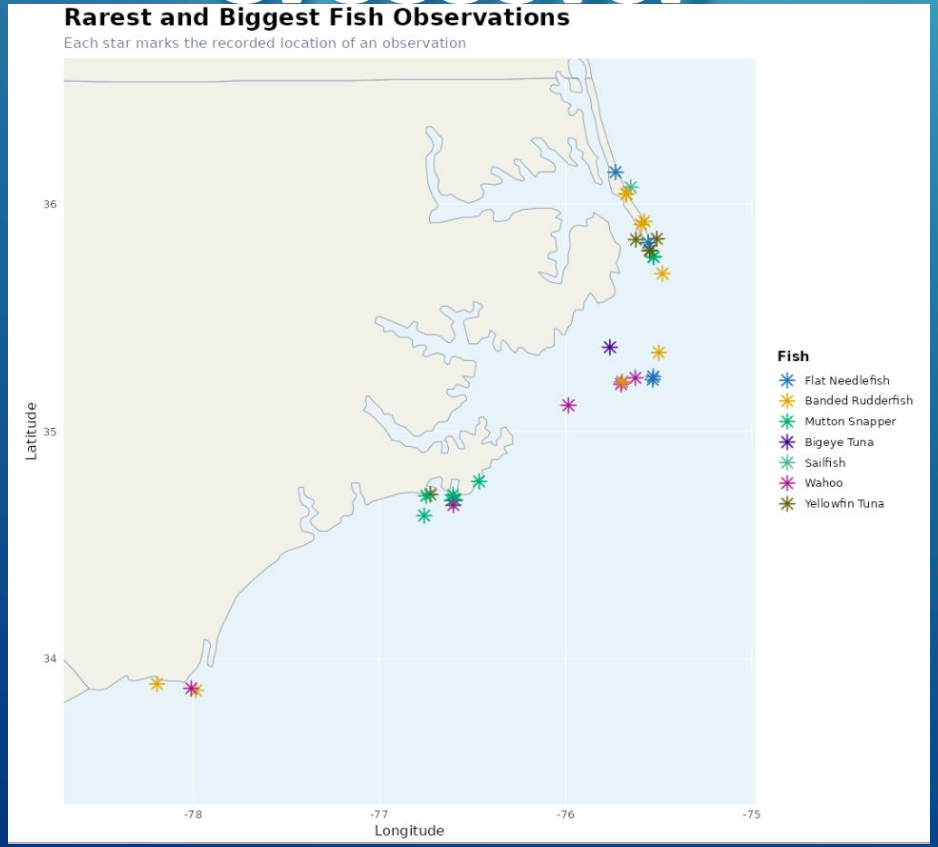
N : Total number of fish landed for a species

C : Number of area–mode combinations that each species appears in

Key findings

- Offshore charter trips have a mean rarity index roughly five times the next best combination.
- Inland shore fishing yields the most common species.

Dataset Crossover



Biggest Fish

Fish	Observations	District(s)
Bigeye Tuna	1	Dare
Bluefin Tuna	0	None recorded
Sailfish	1	Dare
Wahoo	6	Brunswick, Carteret, Dare, Hyde
Yellowfin Tuna	6	Carteret, Dare

Rarest Fish

Fish	Observations	District(s)
Flat Needlefish	4	Dare
Banded Rudderfish	10	Brunswick, Dare
Mutton Snapper	11	Carteret, Dare
Rainbow Runner	0	None recorded
Red Hind	0	None recorded

What did we learn?

Interception

- Fish observations peak in the mountains, and small freshwater fish are most commonly observed
- For marine fishing, farther offshore means bigger, rarer fish, offshore charters have 5× the rarity of any other combination.
- Biggest and rarest marine fish are observed across coastal counties, and some species can’t be found in the observation dataset’s boundaries

Limitations and next steps

- MRIP values are estimates extrapolated from harvested fish
- Only 77 species overlap, the crossover rests on 0–11 observations per species.
- Next: We could compare species observation locations with MRIP inland estimates vs. ocean catch areas.

Thanks

