

# Exploring Catch Per Unit Effort (CPUE) Data Utility in Fisheries Assessments

- Micheal S. Allen – University of Florida
- Lisa Hollensead – Gulf Council Staff

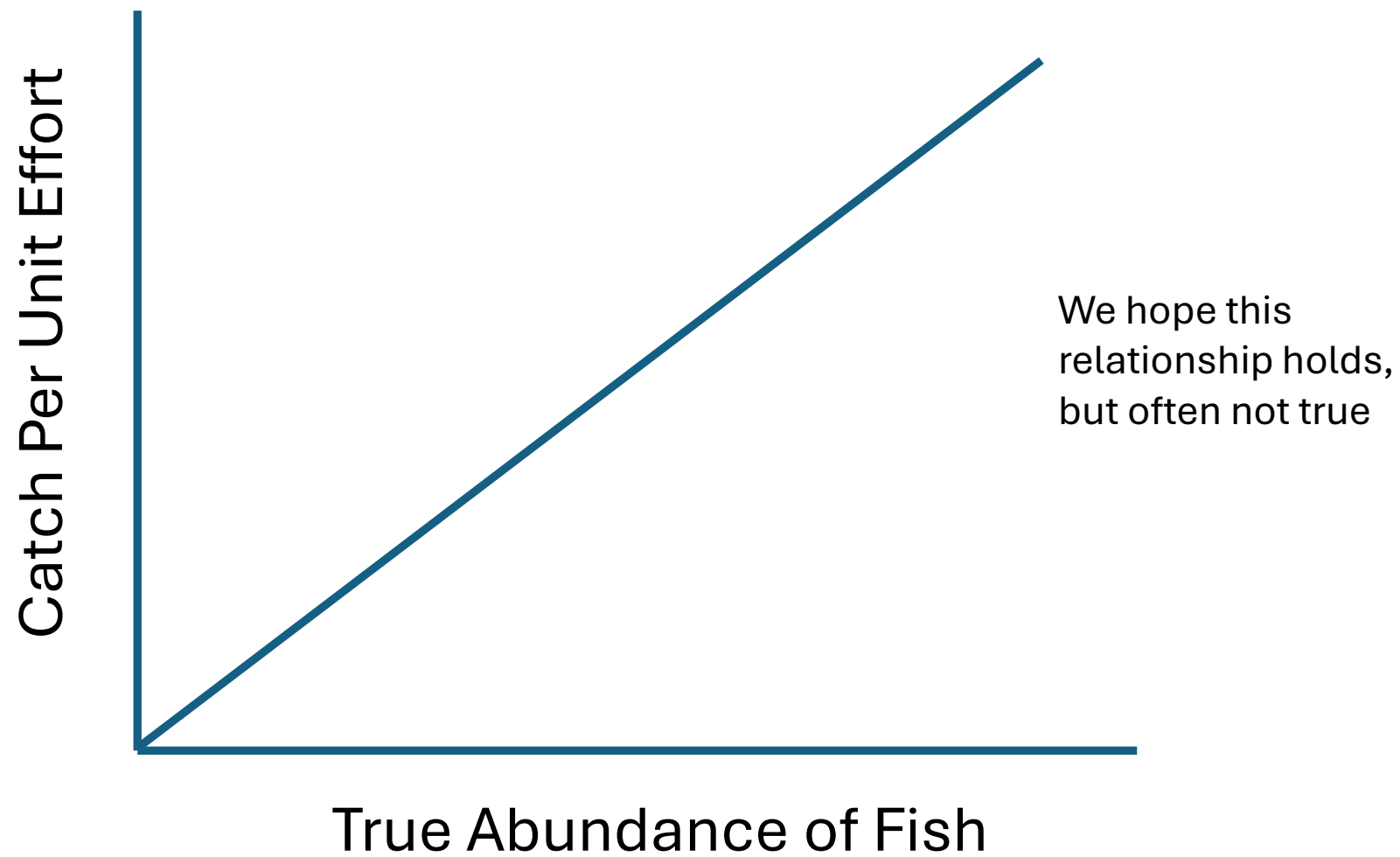


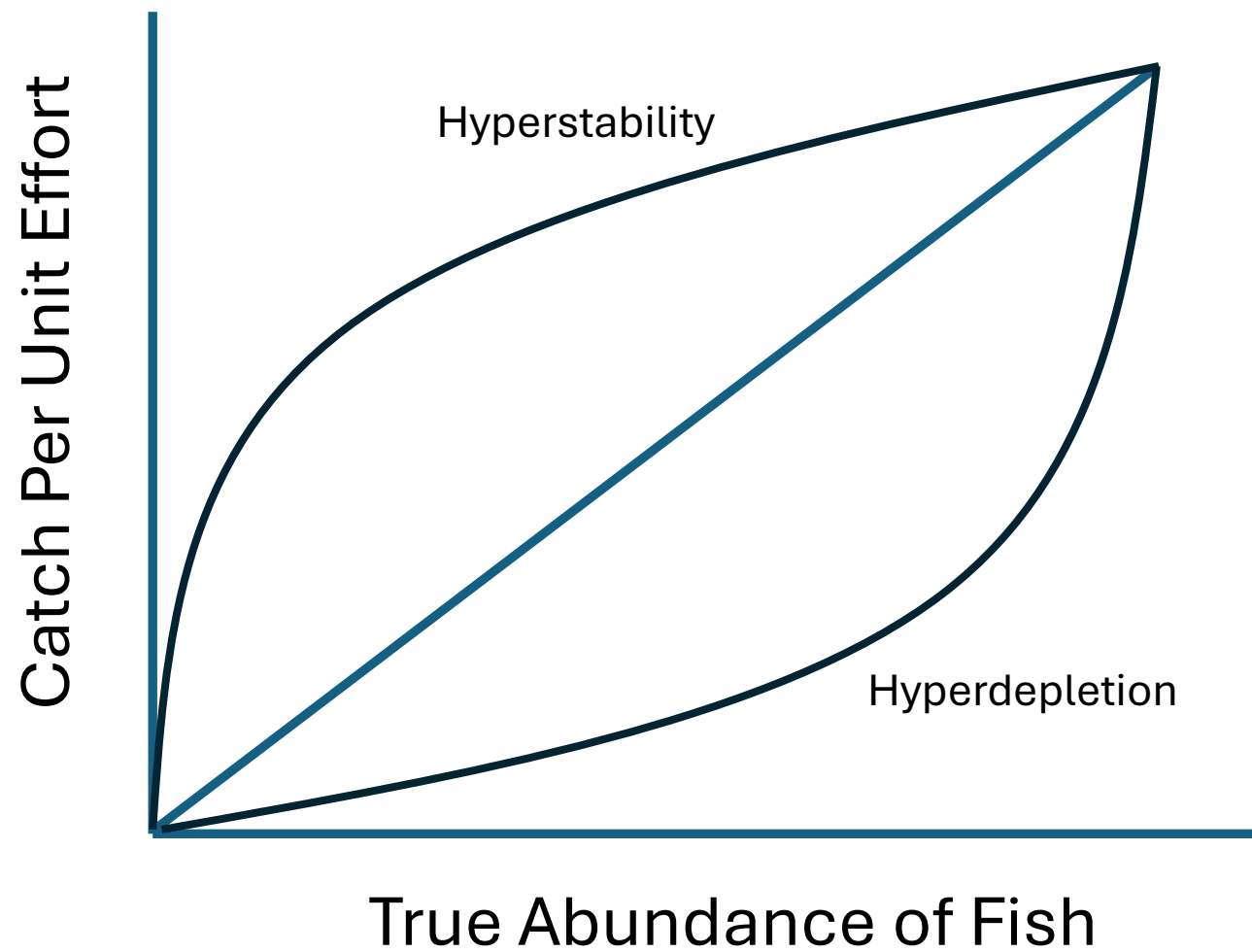


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## Overview

- Catch per unit effort is often used as an index of stock abundance
- As catch per boat day increases, we would infer that means the stock abundance is increasing
  - Often depends on the survey design, and how well the 'sampling' reflects the true abundance of the stock
- This presentation discusses some caution and considerations for use of CPUE data to index stock abundance





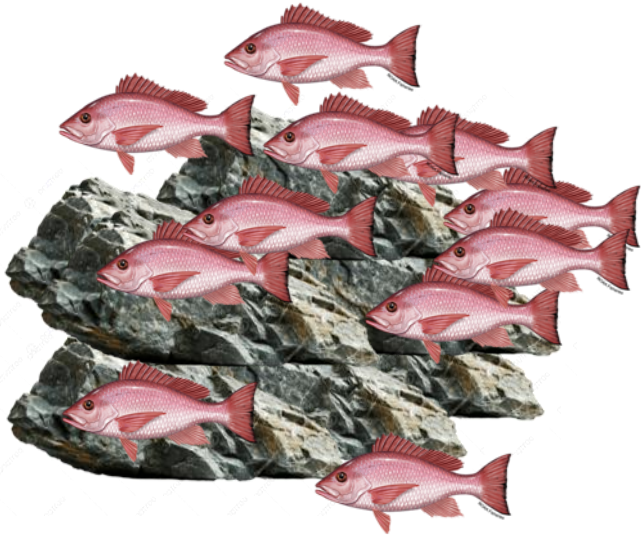
# Fishery Dependent Data – directly from the fishing process



Little known  
locations,  
lower effort



## High Abundance Population



Best  
habitat,  
well known  
location,  
high effort



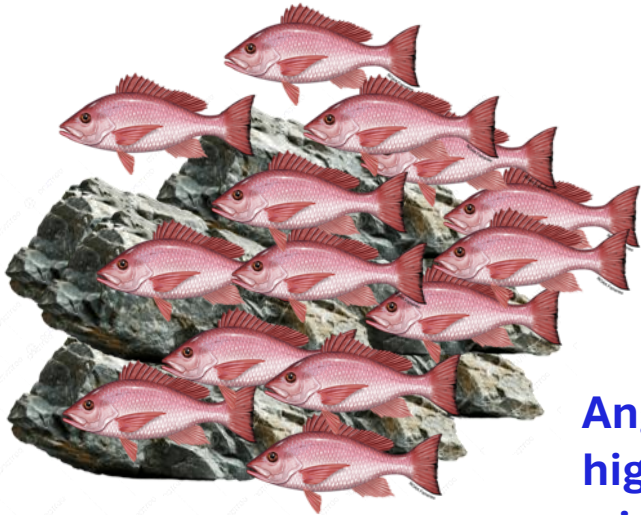
# Fishery Dependent Data



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Anglers can maintain  
high catch rates on  
wide range of habitat  
patches.



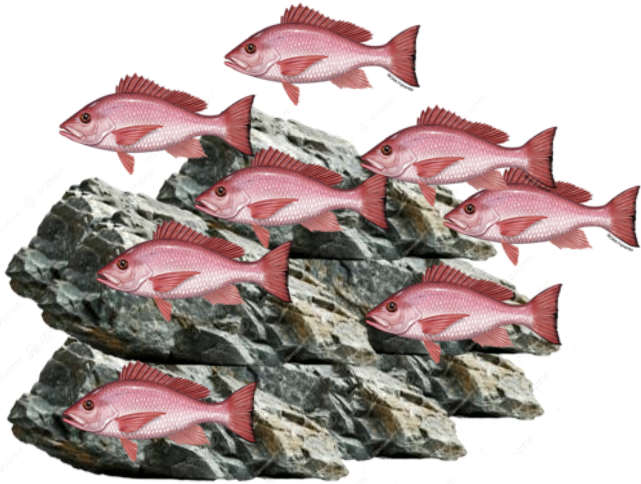
# Fishery Dependent Data



Little known  
location  
low effort



## Lower Abundance Population



Best habitat  
attracts fish,  
well known  
location,  
high effort



# Fishery Dependent Data



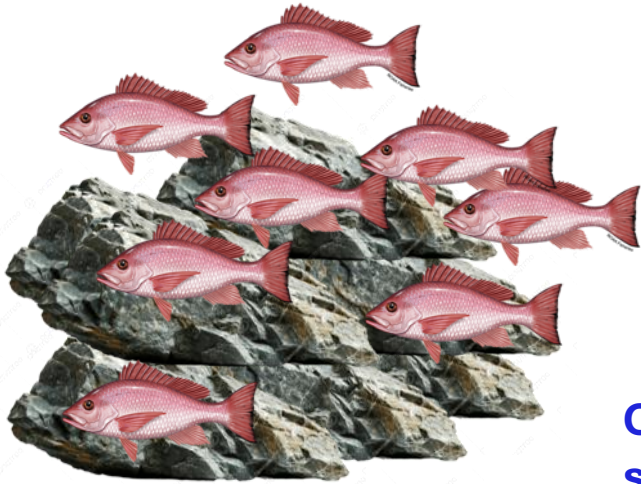
Little known  
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## Lower Abundance Population



Best habitat  
attracts  
fish, well  
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location,  
high effort



Catch per effort remains  
strong on best habitat due  
to fish behavior, although  
the population overall is  
much reduced





- This is the concept called hyperstability, where CPUE remains high despite relatively large population declines.
- Anglers don't fish randomly, they go where catch rates are highest.
- Best habitat can maintain high catch rates despite substantial stock declines.
- Can make CPUE misleading



Photo credit: Shutterstock

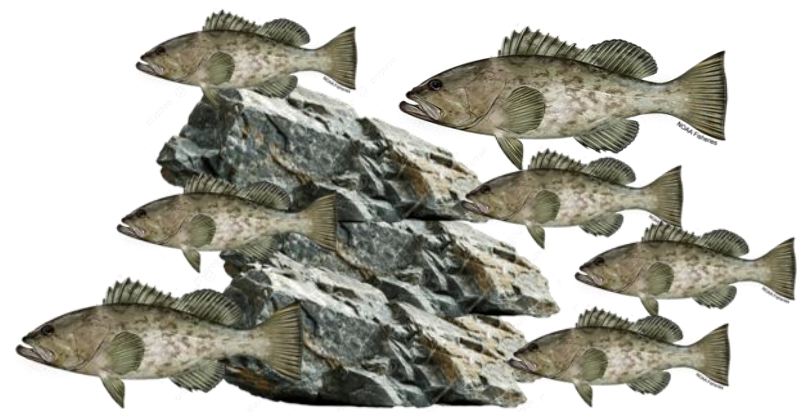
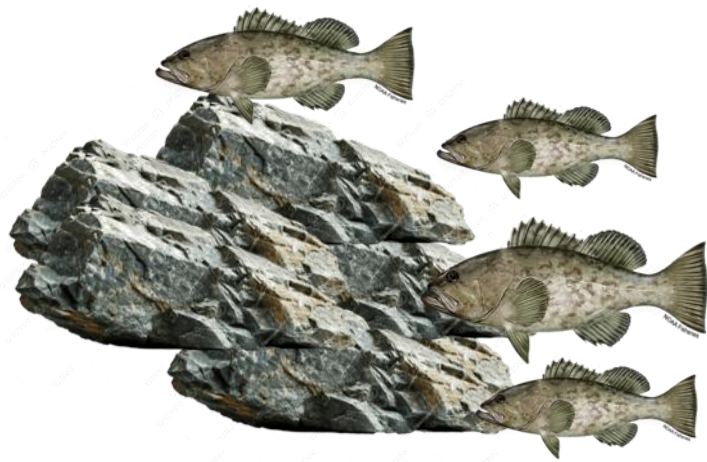
- The most famous example of this is with the 1992 collapse of the Atlantic cod, where schooling behavior of the fish and technology advances allowed CPUE to remain high despite drastic stock declines



- Causes of Hyperstability

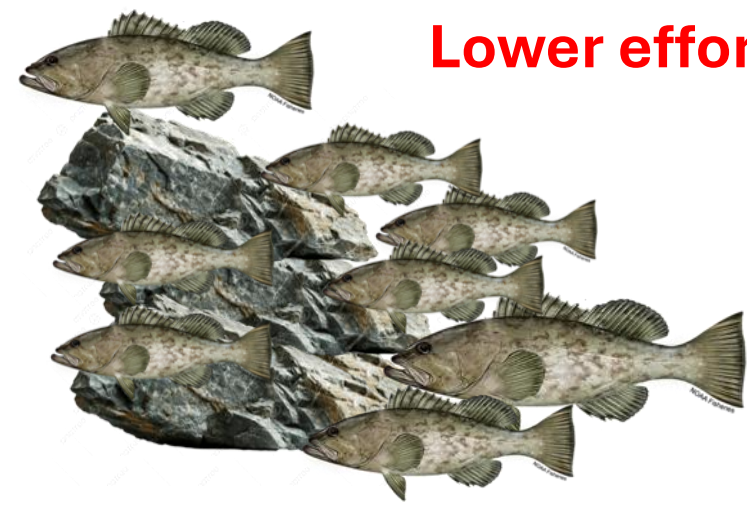
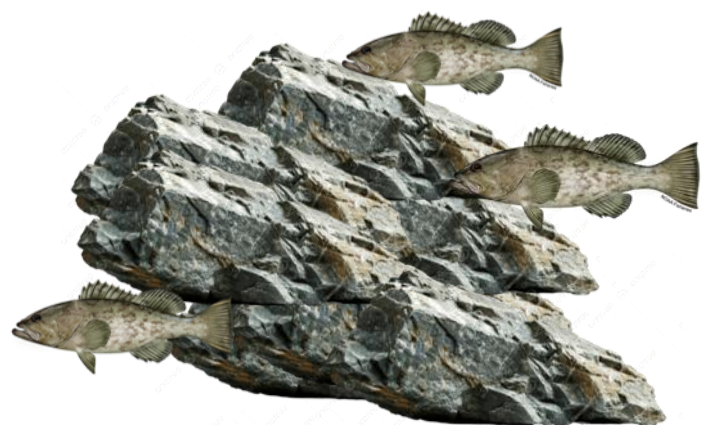
- Nonrandom fishing patterns, anglers modify behavior to maximize catch rates
  - Fish aggregation/schooling behavior
  - Technology advances allow anglers to find best habitat
  - Information sharing, angler communication
  - Fleet dynamics, where the best anglers continue to fish and maintain high catch rates when stocks decline, whereas less effective anglers reduce their effort
- 
- The opposite can also be true, where CPUE declines strongly but does not reflect a whole-population decline

Hyperdepletion – CPUE from the fishery drops substantially, but doesn't reflect overall declines in stock size



High effort

Lower effort



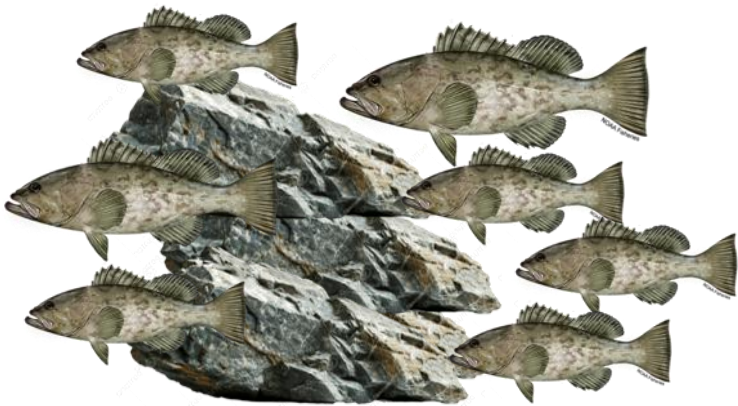
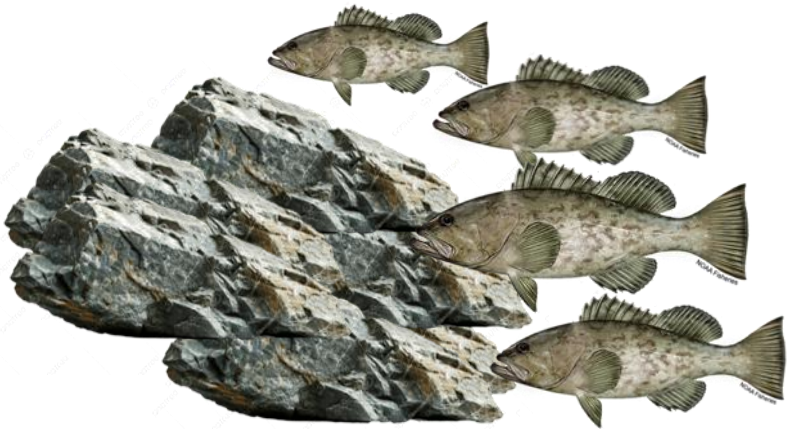
Distance from Shore – Economic/Social Factors



5 Miles

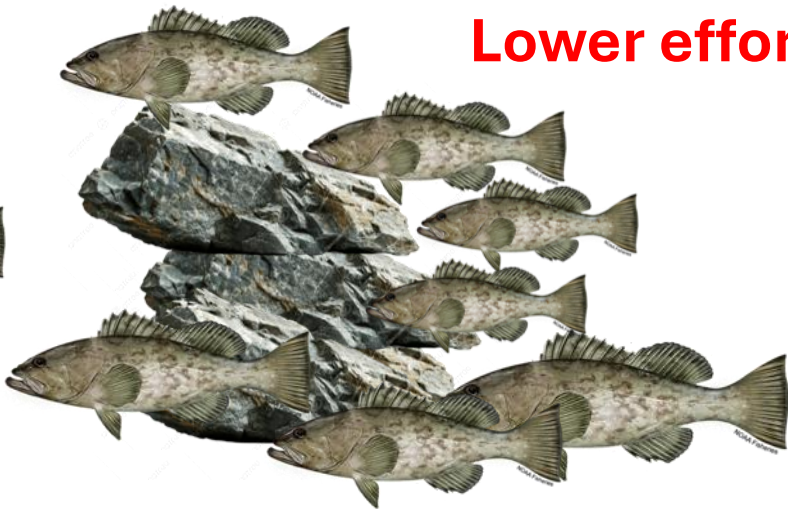
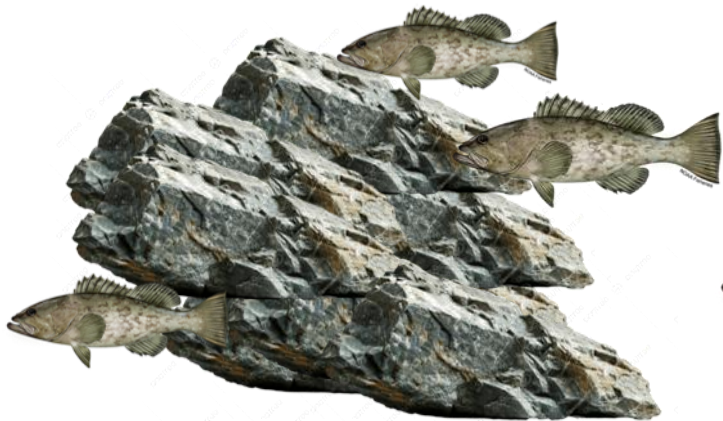
50+ Miles

Hyperdepletion – CPUE from the fishery drops substantially, but doesn't reflect overall declines in stock size



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Distance from Shore



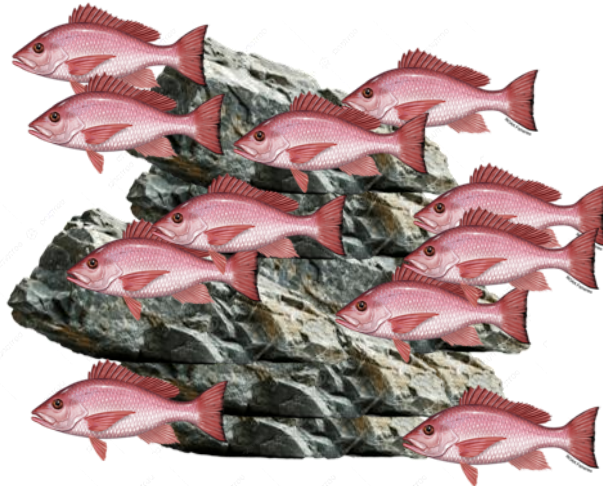
5 Miles

If most of the fleet target sites near shore, average CPUE would decline substantially even if overall stock decline is modest

50+ Miles

# Fishery Independent Data – Various Scientific Surveys

- Generally attempt to sample randomly, such that trends in CPUE reflect true abundance of the stock
- Still not perfect
- Somewhat limited spatial coverage, subject to environmental influences
- But, reduces problems with nonrandom fishing by anglers
- This is why we typically have more confidence in fishery independent CPUE indices compared to fishery dependent data





# Summary

- Usually a mistake to take CPUE from fishery dependent data at face value and assume they reflect stock abundance
- Hyperstability and/or hyperdepletion are nearly always at play
- Spatial data on the fishing fleet can help
- Big need for future research
- That said, considering fishery dependent CPUE data is valuable, with caution on the caveats
- Look for trends across CPUE indices, are they moving together?
- Questions and Discussion

