Historical Perspectives on Faunal Abnormalities and Contaminants in Biscayne Bay

Michael Schmale, Rosenstiel School of Marine, Atmospheric, and Earth Science, University of Miami

Nancy Gassman, Deputy Public Works Director and Chief Resilience Officer, City of Ft. Lauderdale

Laurie Beth Nye, Los Angeles County Water Management District

Jone Corrales, Environmental Protection Agency

Supported by the South Florida Water Management District and a postdoctoral fellowship to N. Gassman from NIH/NIEHS

NOAA/University of Miami Joint Publication
NOAA Technical Memorandum NOS NCCOS CCMA 157
Univ. of Miami RSMAS Tech. Rep. 2002-02

Coastal and Estuarine Data/Document Archaeology and Rescue Program

RESULTS OF A FISH HEALTH SURVEY OF NORTH BISCAYNE BAY June 1976 - June 1977

L. R. Udey
Hofstra University

A. Y. Cantillo
NOAA National Ocean Service

W. Kandrashoff
Independent Consultant

J. A. Browder
NOAA National Marine Fisheries Service

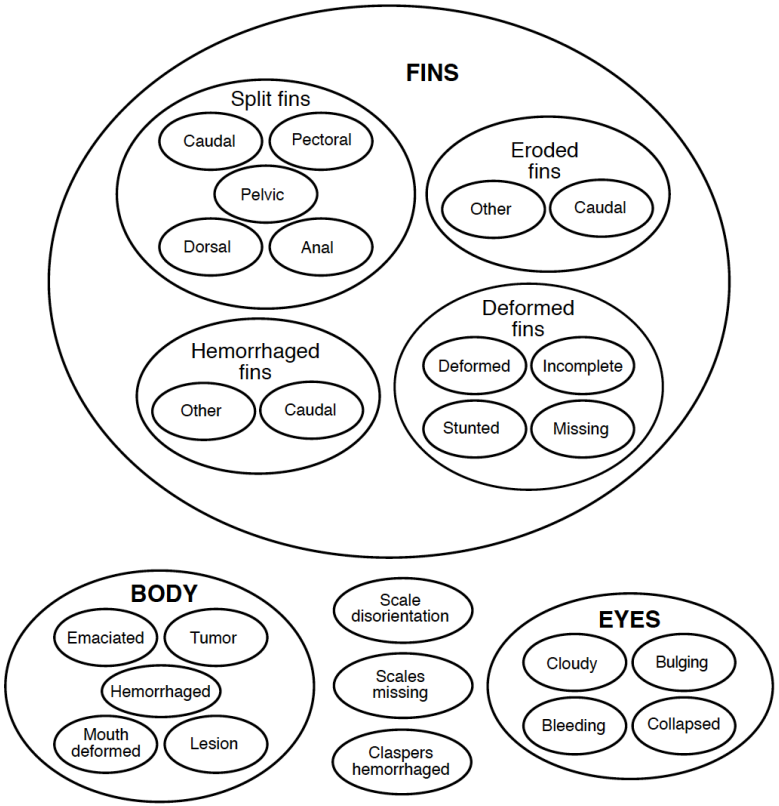


Figure 3. Fish abnormality groups.

Environmental Biology of Fishes **37**: 181–188, 1993.

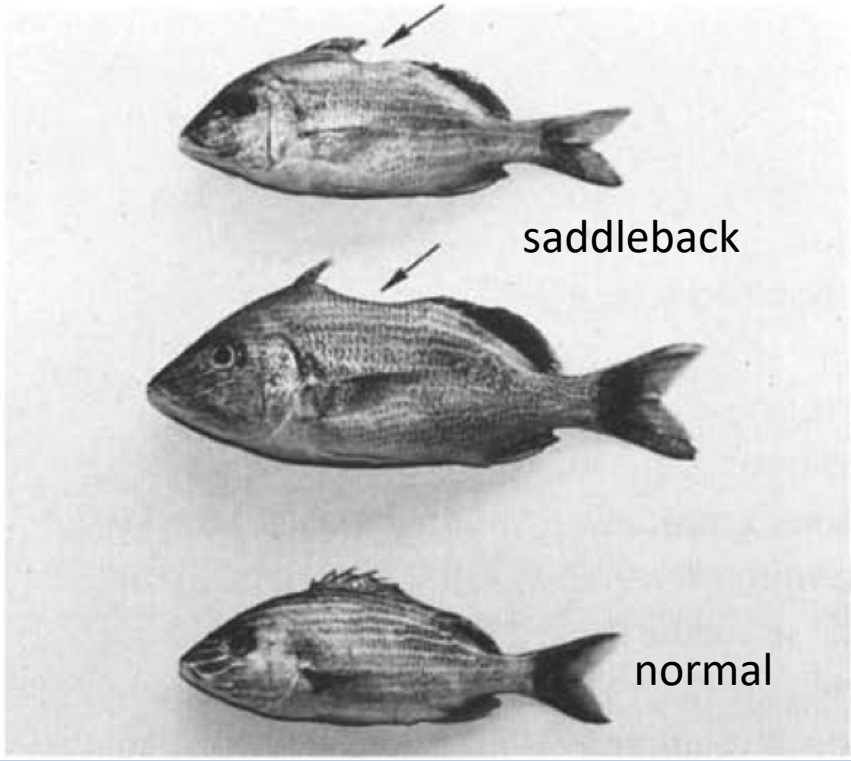
A major developmental defect observed in several Biscayne Bay, Florida, fish species

Joan A. Browder[1,3], David B. McClellan[1], Douglas E. Harper[1], Michael G. Kandrashoff[2] & Walter Kandrashoff[2]

[1] *National Marine Fisheries Service, Southeast Fisheries Science Center, Miami, FL 33149, U.*

[2] *Stuart, FL, U.S.A.*

[3] *Senior author*



Haemulon Sciurus, blue striped grunt

THE STUDY OF TRACE METALS, CHLORINATED PESTICIDES, POLYCHLORINATED BIPHENYLS AND PHTHALIC ACID ESTERS IN SEDIMENTS OF BISCAYNE BAY

by
Eugene F. Corcoran

Rosenstiel School of Marine and Atmospheric Science
University of Miami
4600 Rickenbacker Cswy.
Miami, FL 33149

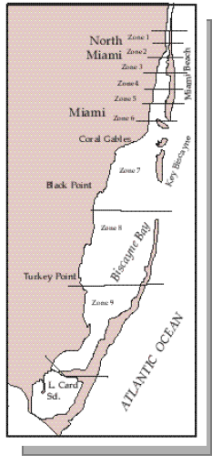
Prepared for
Metropolitan Dade County
Environmental Resources Management
909 S. E. First Ave.
Miami, FL 33131

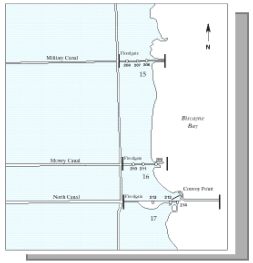
June 1984

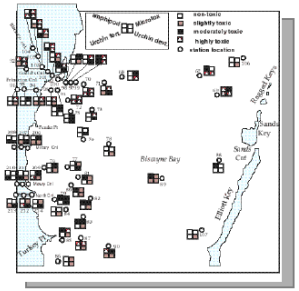
NOAA Technical Memorandum NOS NCCOS CCMA 141

National Status and Trends Program
for Marine Environmental Quality

Magnitude and Extent of Chemical Contamination and Toxicity in Sediments of Biscayne Bay and Vicinity.







Silver Spring, Maryland
December 1999

US Department of Commerce

noaa National Oceanic and Atmospheric Administration

Center for Coastal Monitoring and Assessment
National Centers for Coastal Ocean Science
National Ocean Service

Goals of our study

1. Accurately assess the prevalence of specific abnormalities in fish (and blue crabs) at different sites in Biscayne Bay.
2. Evaluate distribution patterns and look for correlations with previously reported levels of contaminants

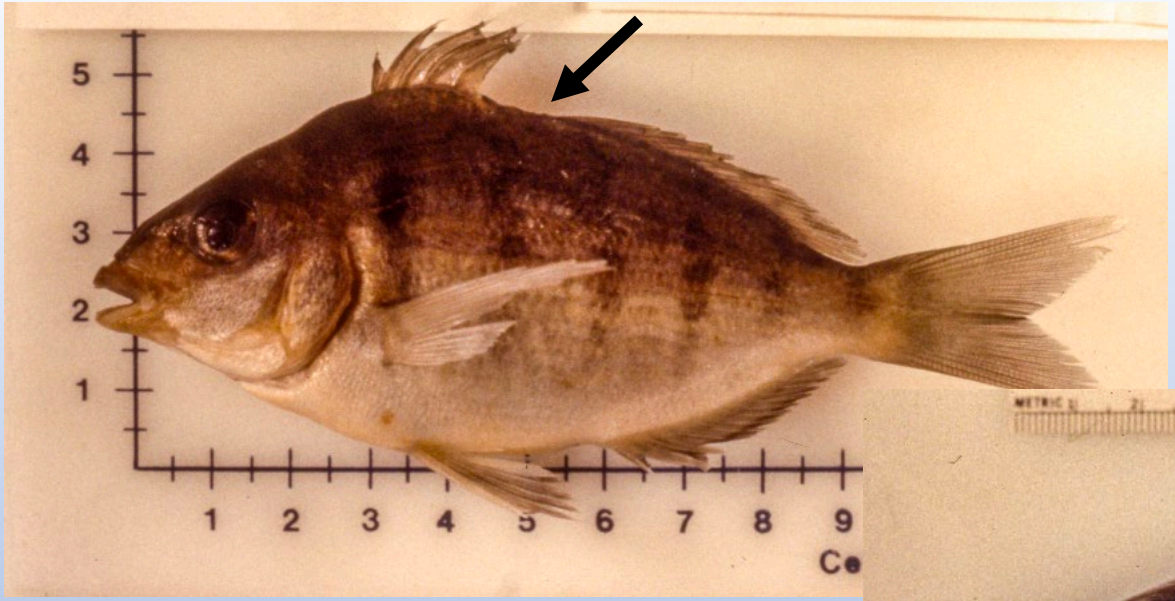
Goals of our study

1. Accurately assess the prevalence of specific abnormalities in fish (and blue crabs) at different sites in Biscayne Bay
2. Evaluate distribution patterns and look for correlations with previously reported levels of contaminants

Methods

- Hook & line at 24 sites, 4-6 surveys each; 1991-92, > 3,000 fish

- Shrimp trawl at 8 sites, resampled monthly; 1993-94, > 5,000 fish (courtesy of Jimbo & Co.)

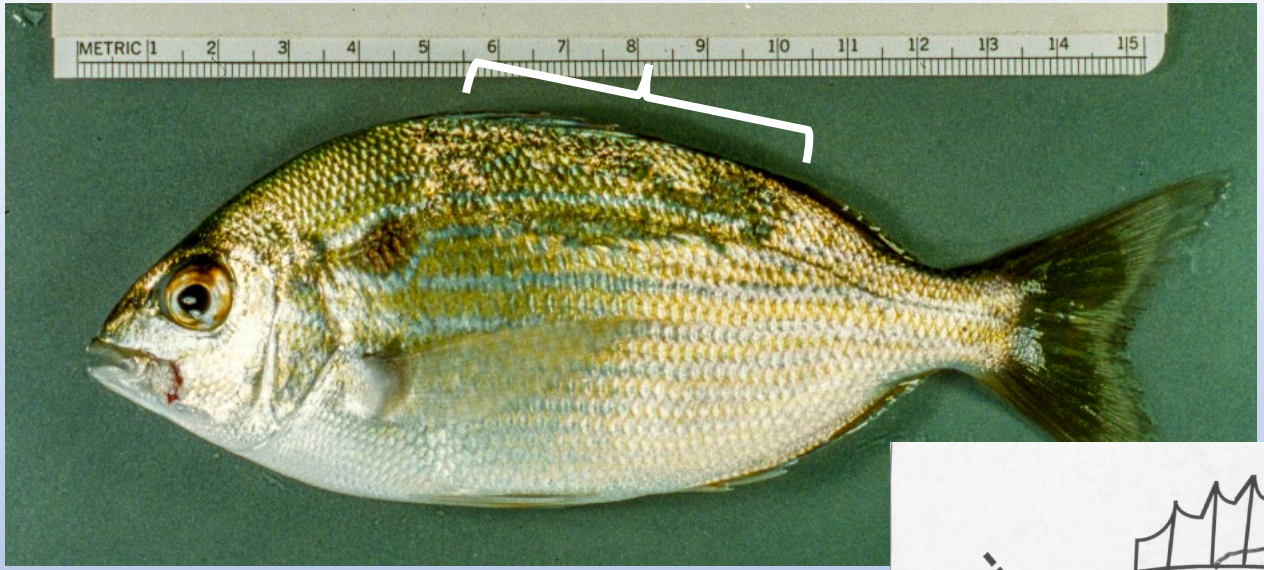


Saddleback, *Lagodon rhomboides*, pinfish

Tumor (neurofibroma), *Lutjanus griseus*, gray snapper

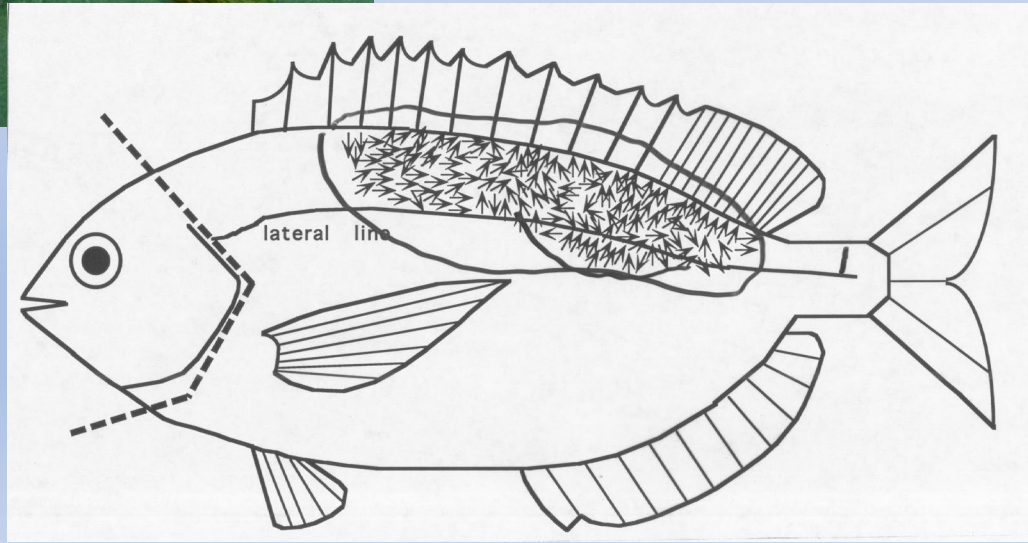
Missing/deformed fin rays *Lutjanus griseus*, gray snapper

Scale disorientation

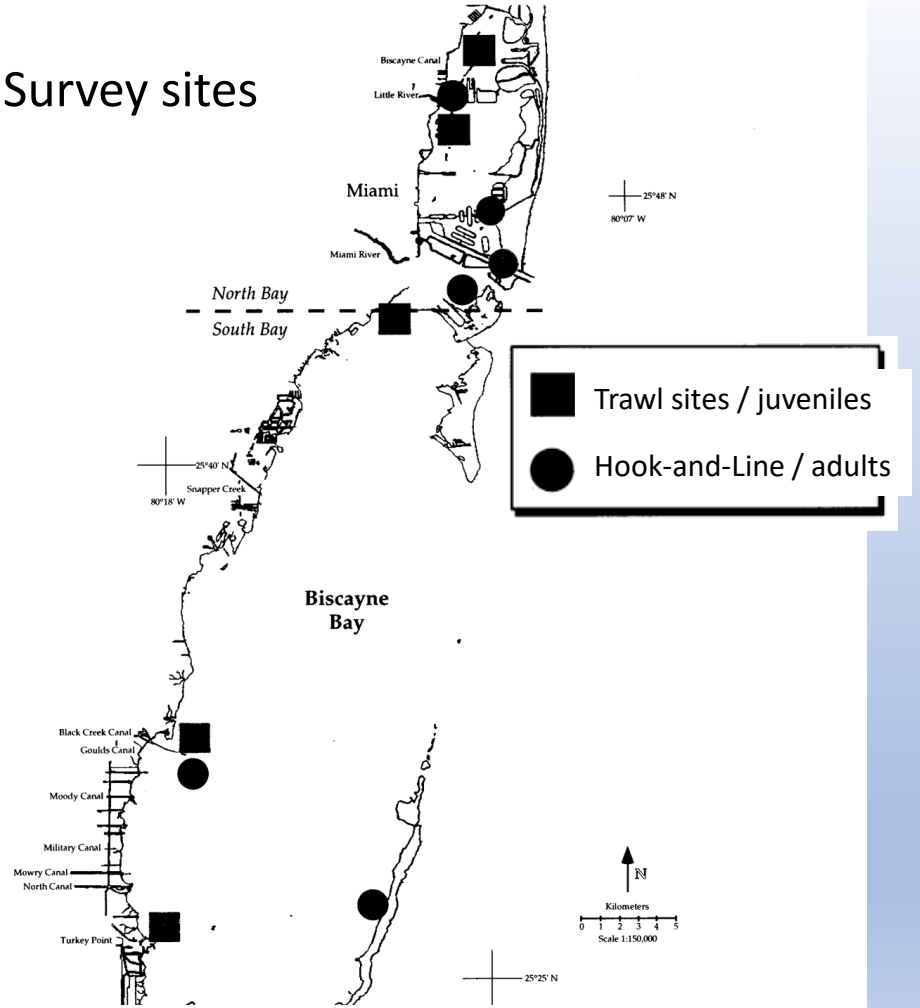


Lagodon rhomboides, pinfish

Scales are be rotated in any & multiple directions but are still essentially flat against the body surface



Survey sites



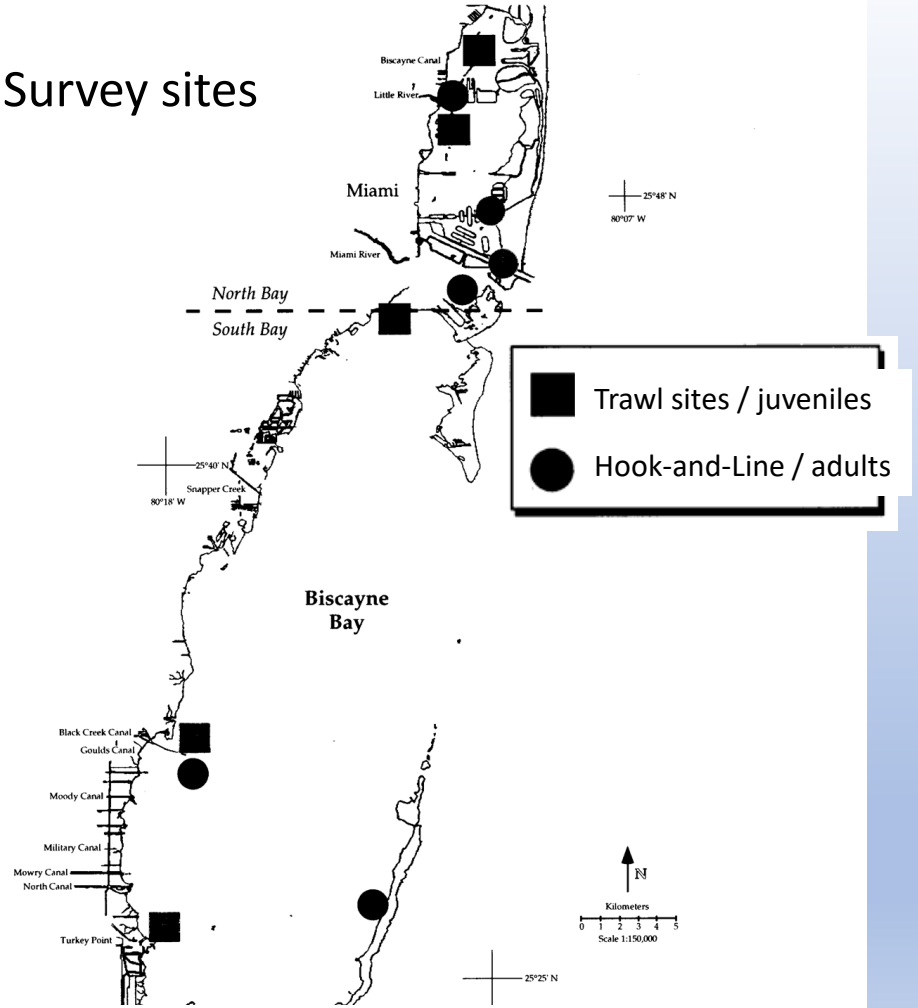
Gassman et al (1994) Bulletin of Marine Science

Correlation Analyses* - All Abnormalities

- All species combined:
  - Positive correlation with Total hydrocarbons
  - Positive correlation with aromatic hydrocarbons
- *Haemulon sciurus*, blue striped grunt, positive correlation with copper concentrations

* $p<0.05$ Spearman rank correlation

Survey sites



Gassman et al (1994) Bulletin of Marine Science

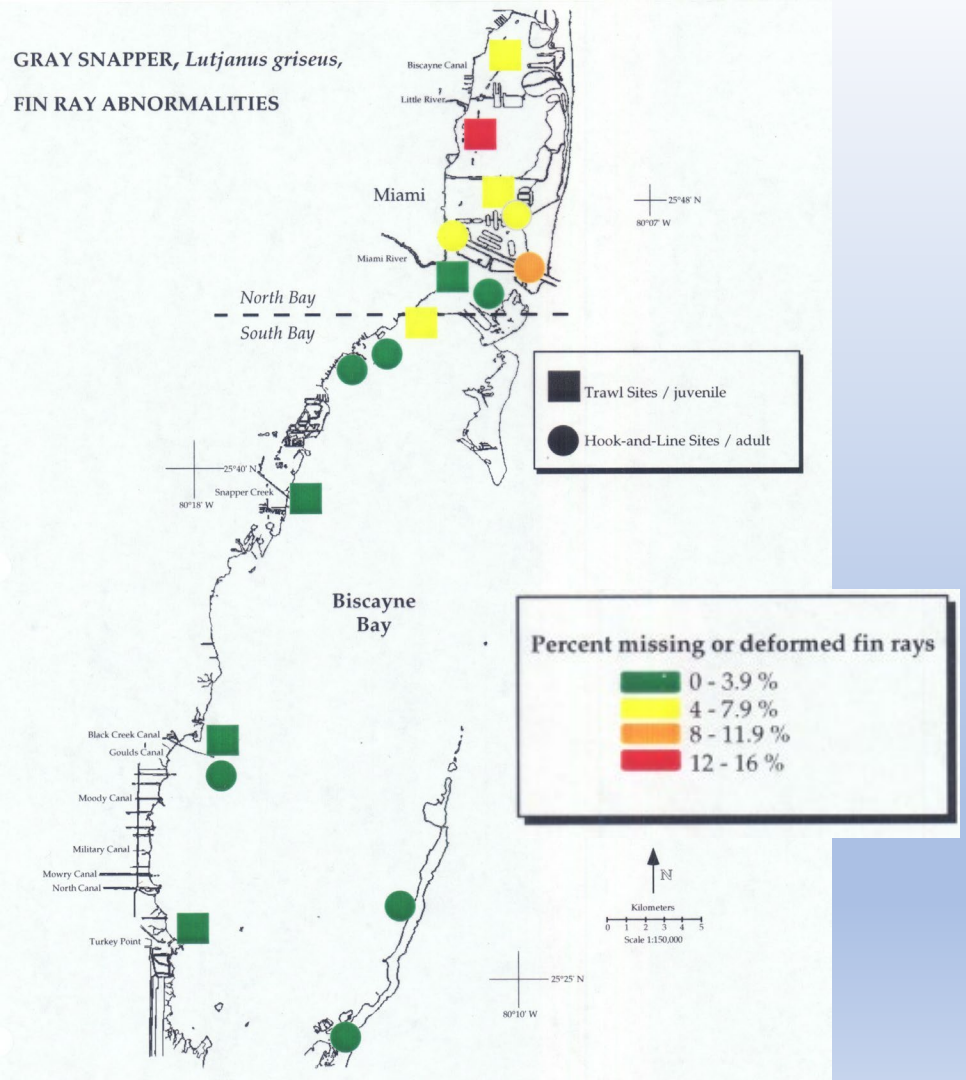
Correlation Analyses* - All Abnormalities

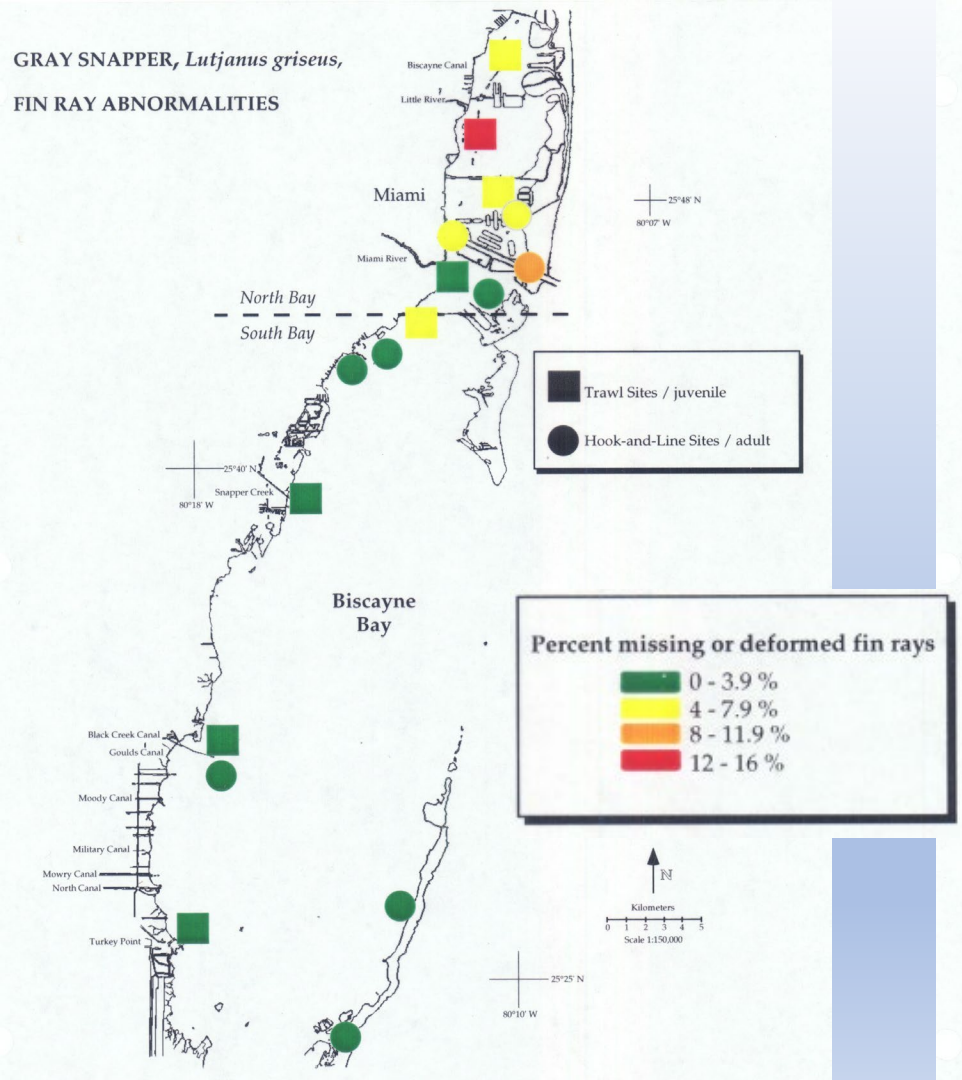
- All species combined:
  - Positive correlation with Total hydrocarbons
  - Positive correlation with aromatic hydrocarbons
- *Haemulon sciurus*, blue striped grunt, positive correlation with copper concentrations

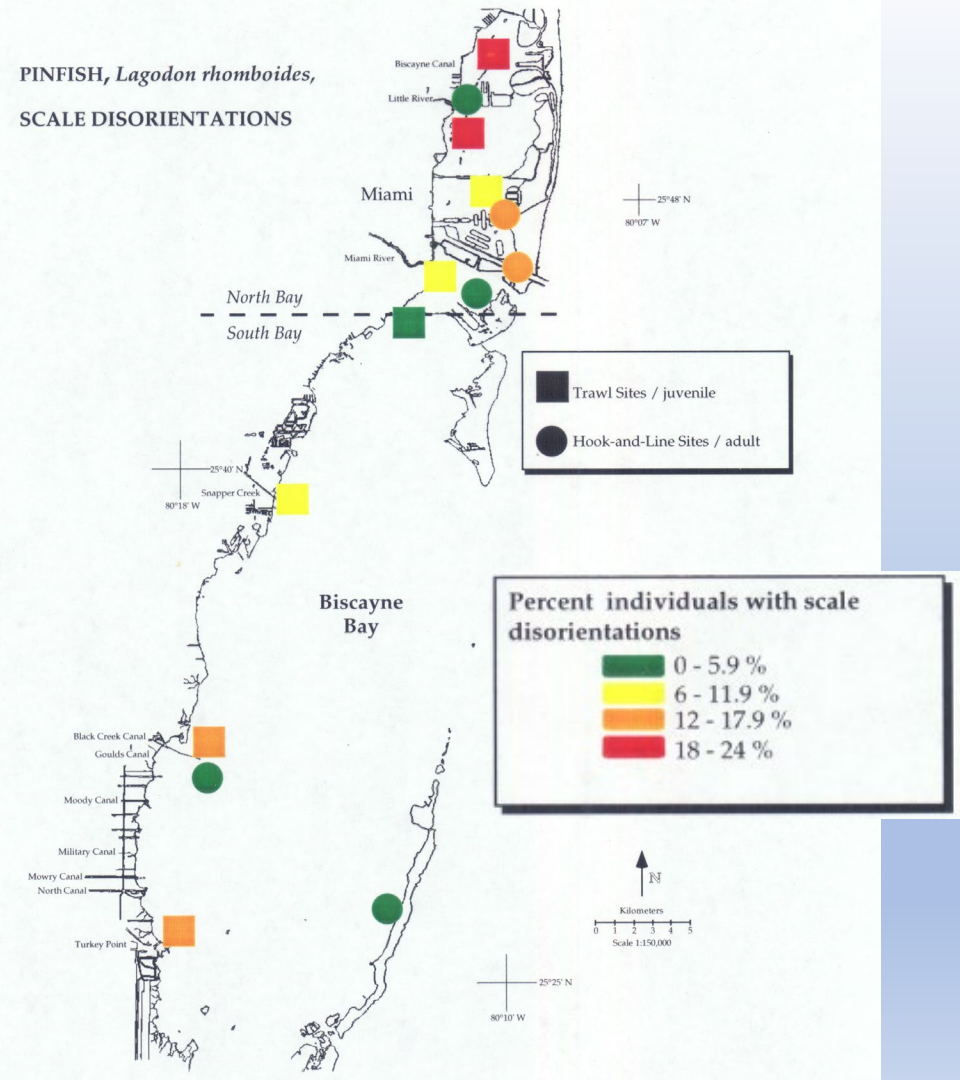
Limitations

- Few matches between historical sediment sample sites and fish sample sites
- Uneven fish distributions
- Fish move

* $p<0.05$ Spearman rank correlation


GRAY SNAPPER, Lutjanus griseus,
FIN RAY ABNORMALITIES
Biscayne Canal
Little River
Miami
25°48' N
80°07' W
Miami River
North Bay
South Bay
Trawl Sites / juvenile
Hook-and-Line Sites / adult
25°40' N
80°18' W
Snapper Creek
Biscayne Bay
Percent missing or deformed fin rays
0 - 3.9 %
4 - 7.9 %
8 - 11.9 %
12 - 16 %
Black Creek Canal
Goulds Canal
Moody Canal
Military Canal
Mowry Canal
North Canal
Turkey Point
N
Kilometers
0 1 2 3 4 5
Scale 1:150,000
25°25' N
80°10' W

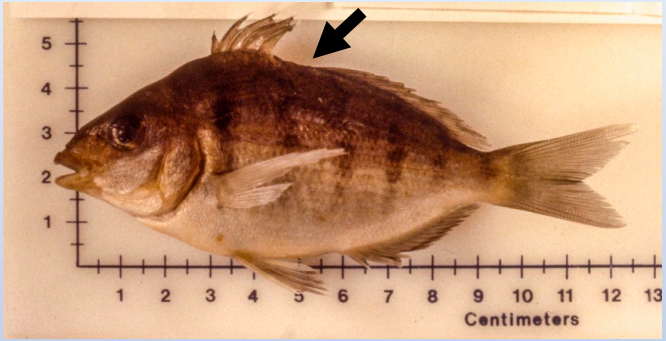

GRAY SNAPPER, Lutjanus griseus,
FIN RAY ABNORMALITIES
Biscayne Canal
Little River
Miami
Miami River
25°48' N
80°07' W
North Bay
South Bay
Trawl Sites / juvenile
Hook-and-Line Sites / adult
25°40' N
80°18' W
Snapper Creek
Biscayne Bay
Black Creek Canal
Goulds Canal
Moody Canal
Military Canal
Mowry Canal
North Canal
Turkey Point
Percent missing or deformed fin rays
0 - 3.9 %
4 - 7.9 %
8 - 11.9 %
12 - 16 %
N
Kilometers
0 1 2 3 4 5
Scale 1:150,000
25°25' N
80°10' W


PINFISH, Lagodon rhomboides,
SCALE DISORIENTATIONS
Biscayne Canal
Little River
Miami
Miami River
25°48' N
80°07' W
North Bay
South Bay
Trawl Sites / juvenile
Hook-and-Line Sites / adult
25°40' N
80°18' W
Snapper Creek
Biscayne Bay
Black Creek Canal
Goulds Canal
Moody Canal
Military Canal
Mowry Canal
North Canal
Turkey Point
Percent individuals with scale disorientations
0 - 5.9 %
6 - 11.9 %
12 - 17.9 %
18 - 24 %
N
Kilometers
0 1 2 3 4 5
Scale 1:150,000
25°25' N
80°10' W

What are the implications for the current state of fish health in Biscayne Bay??

Chronic vs acute stresses?

Gross abnormalities today?



vs

Large Fish Kills
- August 2020
- October 2022

(image from Miami Waterkeeper website)

Joan Browder continued to be active in this area, participating in the Biscayne Bay Coordination group organized by Miami Waterkeeper