# Benthic Invertebrate Community Composition and Sediment Properties in Barnegat Bay, 1965 to 2014

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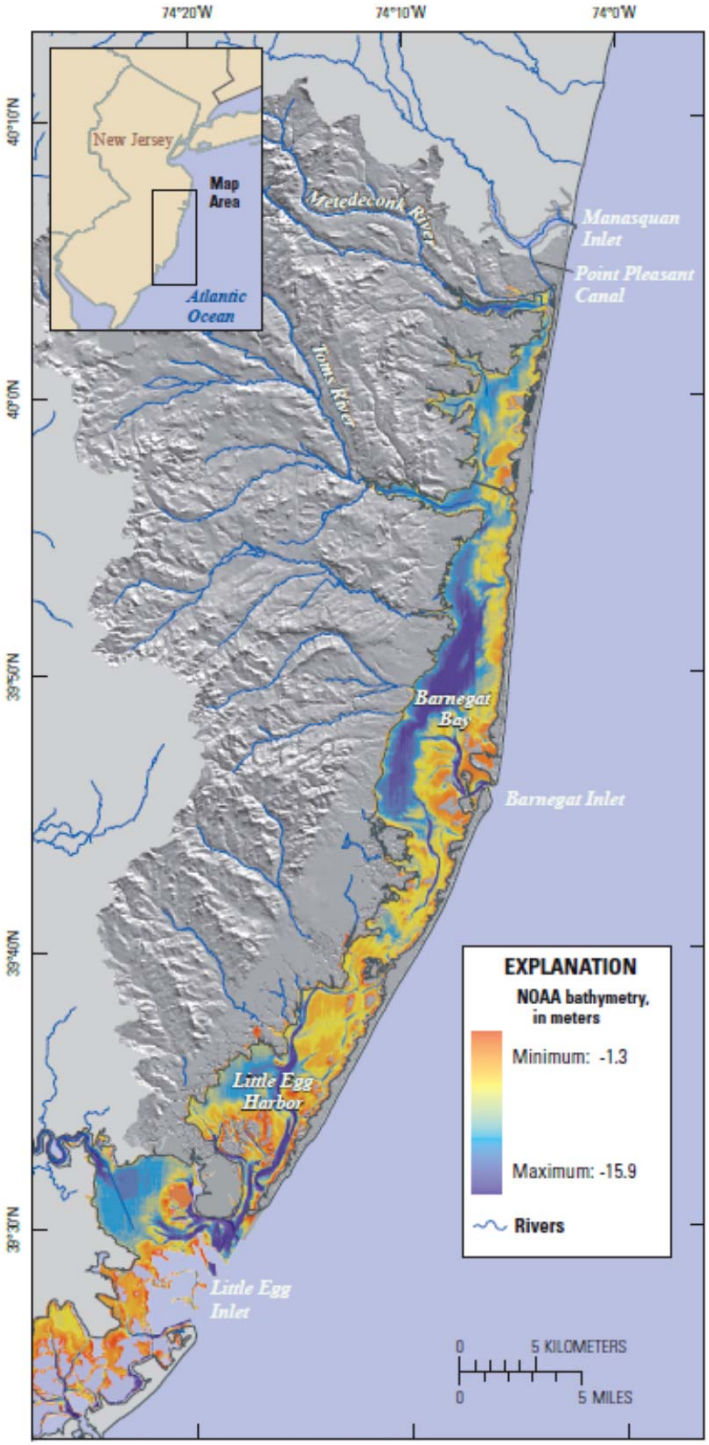
# Take-home summary

Compared with (limited) historical data from 49 years ago, the benthic invertebrate community today is nearly unchanged

Compared with (limited) historical data, sediment physical and chemical properties today are improved or similar

Based on the kinds and abundances of bottom-dwelling animals, habitat quality in Barnegat Bay-Little Egg Harbor is good to high

Shallow, back-barrier estuary
North-to-south salinity gradient
North-to-south human population gradient
East-to-west sediment particle size gradient
East-to-west sediment organic matter content gradient




Andrews et al. (2015) doi: 10.3133/ds937

# Governor Christie's Comprehensive Action Plan to Address the Ecological Decline of Barnegat Bay

## Six Month Update

presented by
NJDEP Commissioner Bob Martin

Toms River Municipal Building
L.M. Hirshblond Room, 2nd Floor
33 Washington Street
Toms River, NJ 08753
June 27, 2011

State of New Jersey
Department of Environmental Protection

BARNEGAT BAY ACTION ITEM #9

# Produce More Comprehensive Research

*"The research projects being funded by the NJDEP should not only improve our understanding of the bay but also help inform management decisions to address the troubling conditions of the Bay."*

Stan Hales, Director
Barnegat Bay Partnership

## COMPLETED MILESTONES

- Assessed research to identify data needs.
- Identified eight research projects that provide critical missing information on the health of Barnegat Bay.
- Posted online bibliography of Barnegat Bay Research.
- Developed a comprehensive plan for future research needs.
- Completed research, nutrient and ecological histories of Barnegat Bay.

## NEXT STEPS

- Award research contracts.
- Conduct research projects: establish baseline condition of bay and fill in critical data gaps.


Brigantine Salt Marsh

Over the years, extensive research has been conducted on Barnegat Bay but the work has not been fully coordinated - resulting in some key gaps in the data. Understanding the Bay's baseline condition will provide a solid basis for future comparisons to measure the effectiveness of the Comprehensive Plan of Action. The NJDEP Office of Science has been working with the Science Advisory Board, state universities, the U.S. Geological Survey, the U.S. Environmental Protection Agency, and the Barnegat Bay Partnership to develop and fund the additional research needed to fill in the data gaps. In conjunction with water quality analysis this research will assist in answering fundamental questions about the current status of the Bay ecosystem.

Benthic invertebrates are sediment-dwelling animals such as worms, clams, crustaceans, etc.

# Why care about benthic invertebrates?

Have important ecological roles

Species differ in tolerances to stress

Most species are relatively sedentary

The types of species and how abundant they are can be used as an “index” of habitat quality

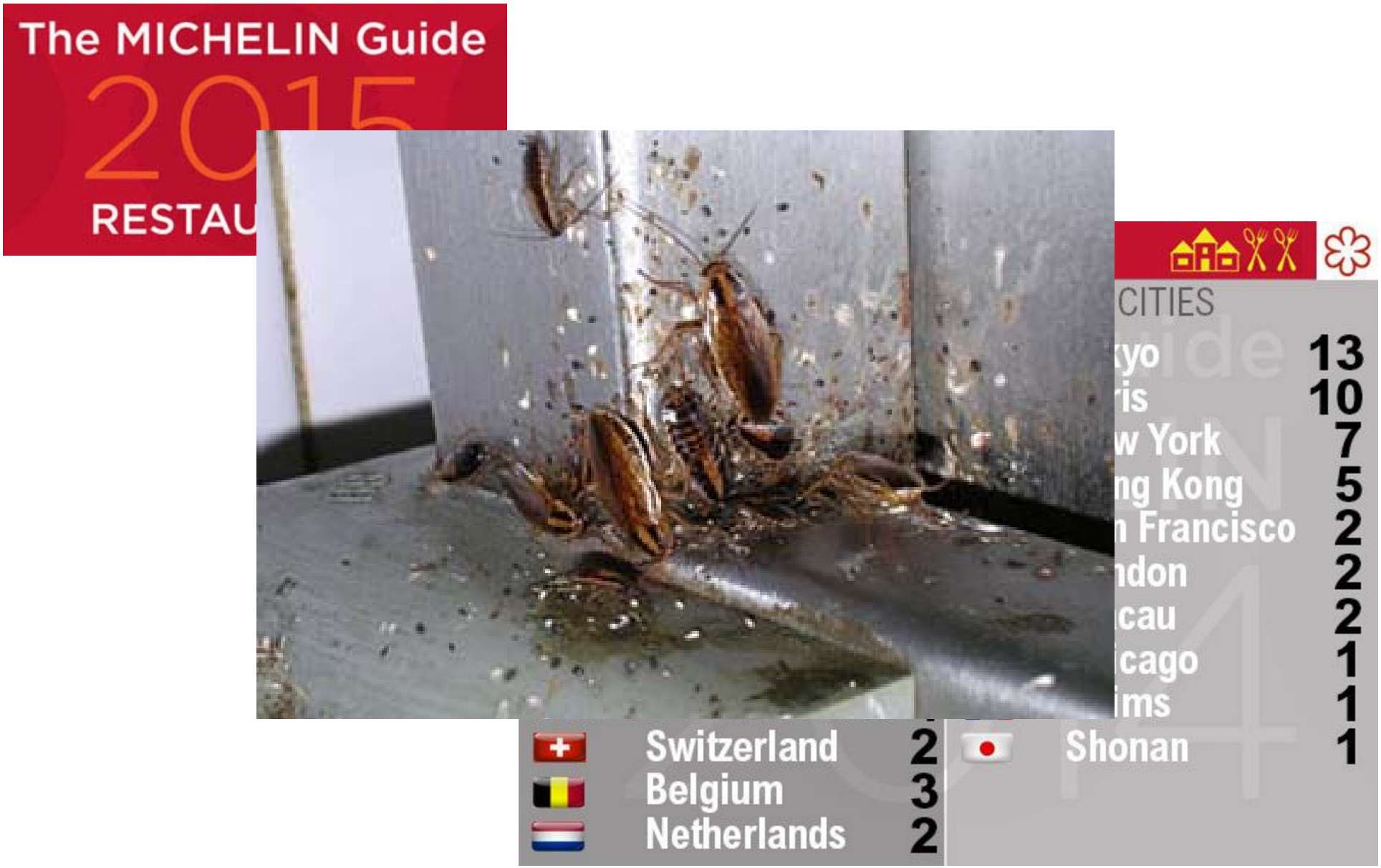
# An analogy: rating restaurants


**3-Star restaurants worldwide**

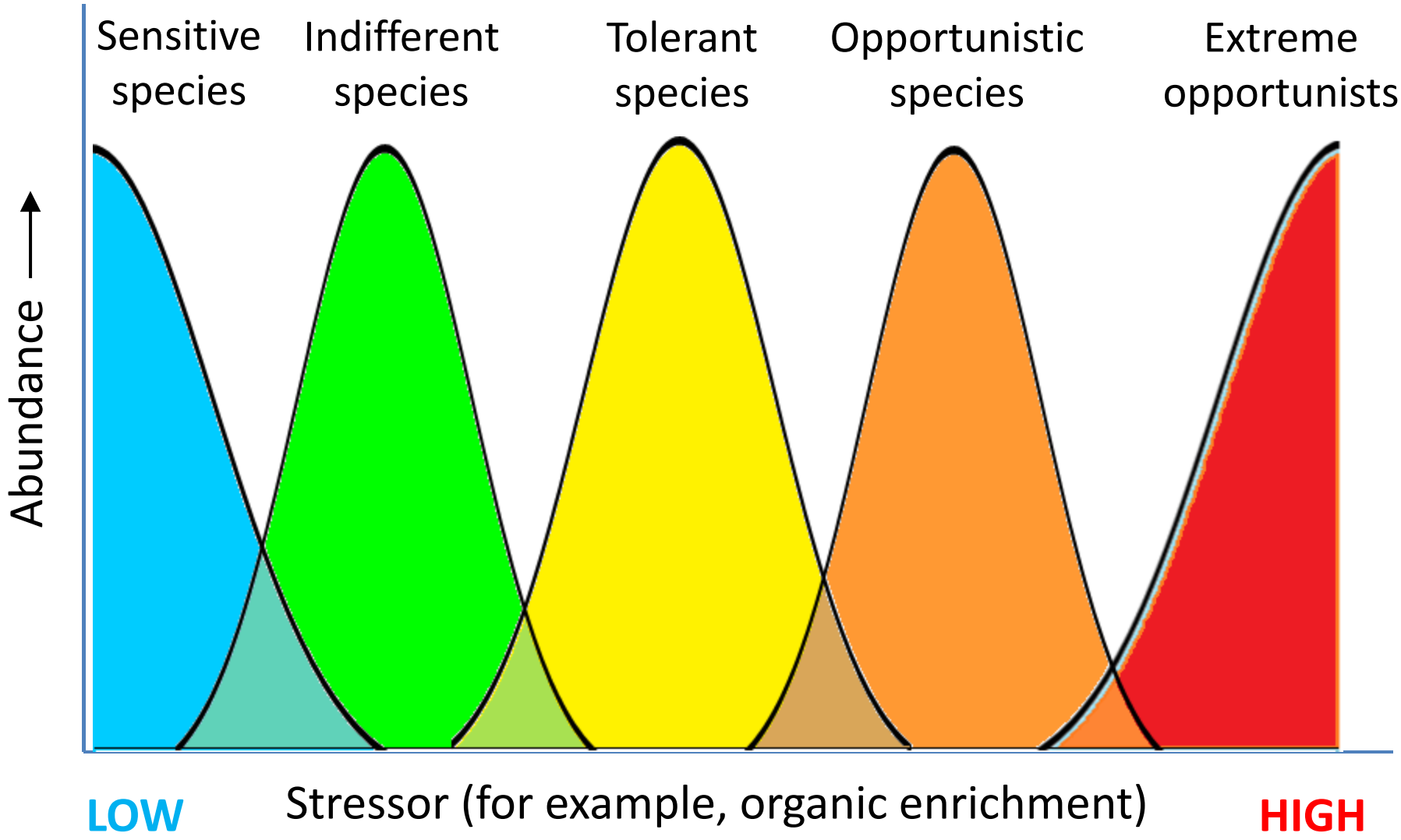
| COUNTRY | |
|---|---|
| Japan | 28 |
| France | 27 |
| Germany | 11 |
| US | 10 |
| Spain | 8 |
| Italy | 8 |
| China | 7 |
| Spain | 7 |
| The UK Ireland | 4 |
| Switzerland | 2 |
| Belgium | 3 |
| Netherlands | 2 |

| CITIES | |
|---|---|
| Tokyo | 13 |
| Paris | 10 |
| New York | 7 |
| Hong Kong | 5 |
| San Francisco | 2 |
| London | 2 |
| Macau | 2 |
| Chicago | 1 |
| Reims | 1 |
| Shonan | 1 |

# An analogy: rating restaurants



# A commonly observed response: Species differ in their sensitivity or tolerance to stress



# What we did

Sediment sampling at 100 locations in July 2012, 2013, 2014

Total of 156,578 individuals

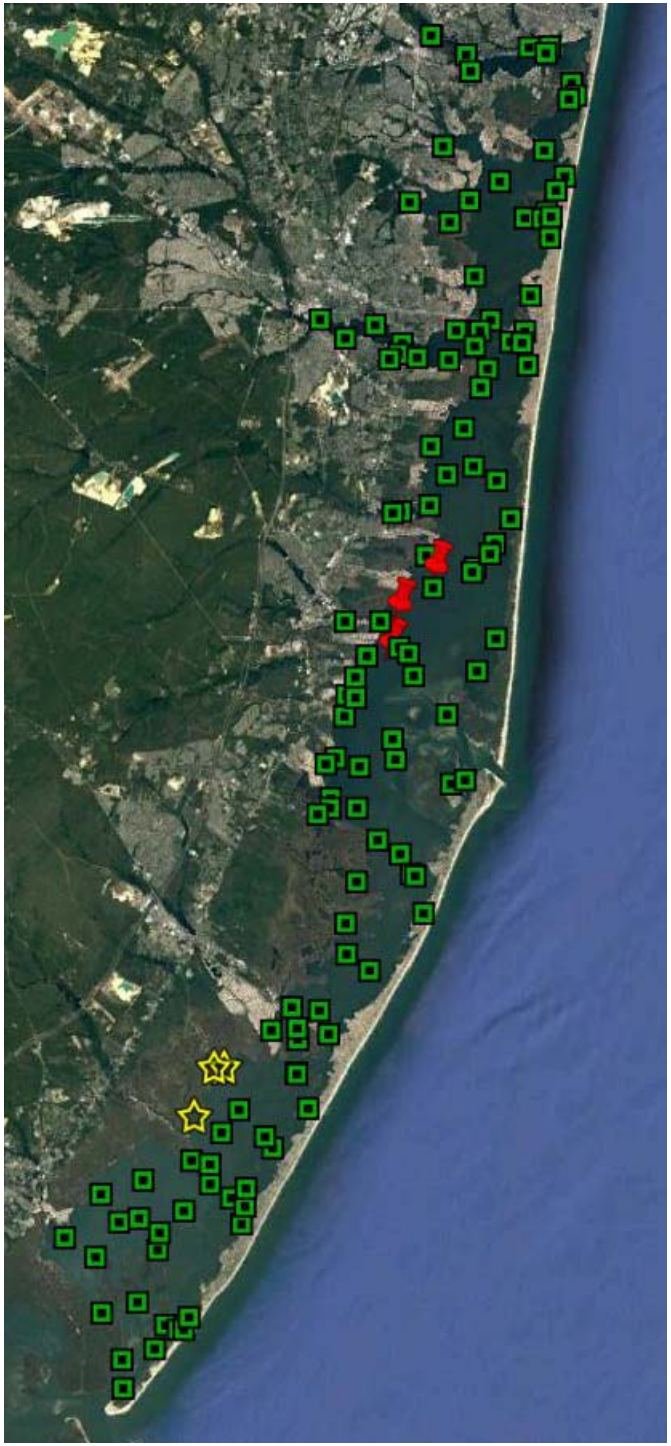
Total of 191 species

# What went before – locations sampled in:

1965–1973 (Phillips, Loveland and Vouglitois)

1973–1974 (Haskin and Ray)

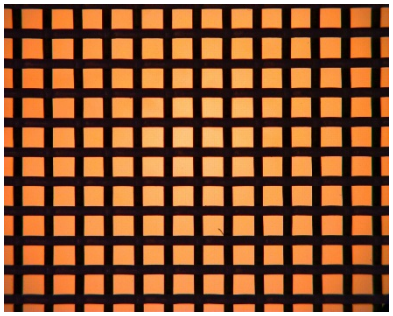
1990–2006 (US EPA)



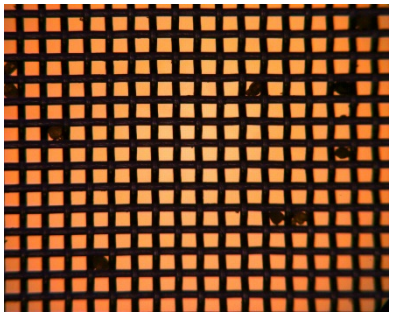
# What hinders comparing data sets?

## Changes in sampling gear, sample processing

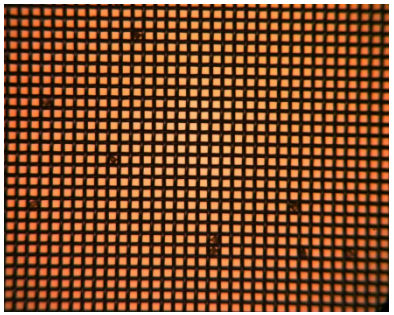
1965–1973



1973–1974

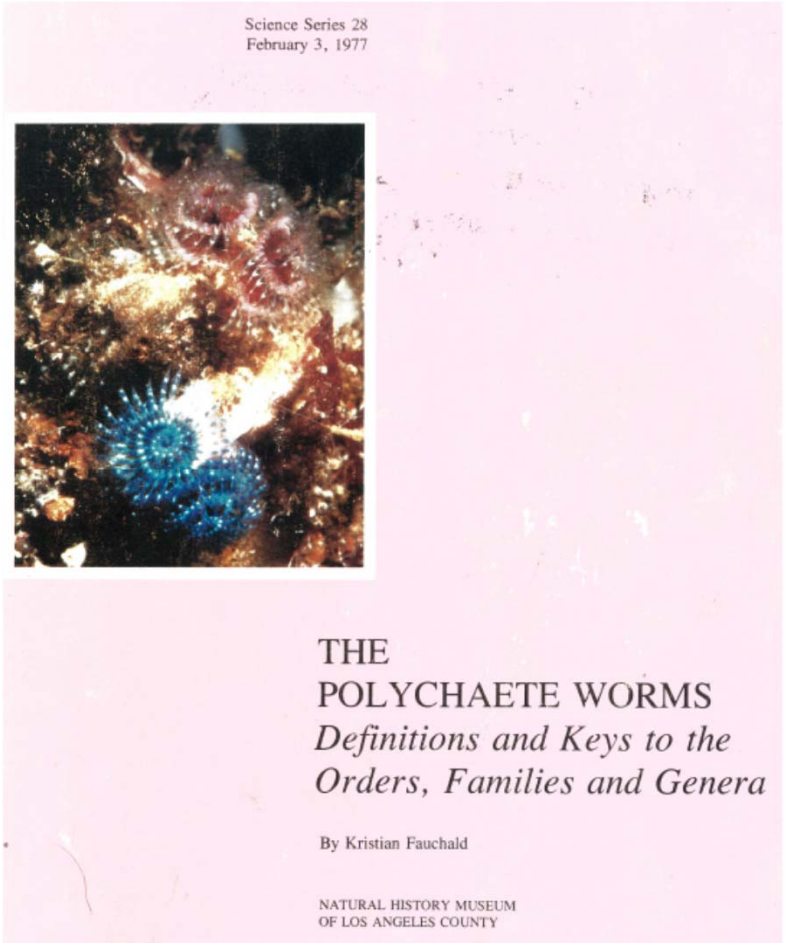


1990–2006,
2012–2014



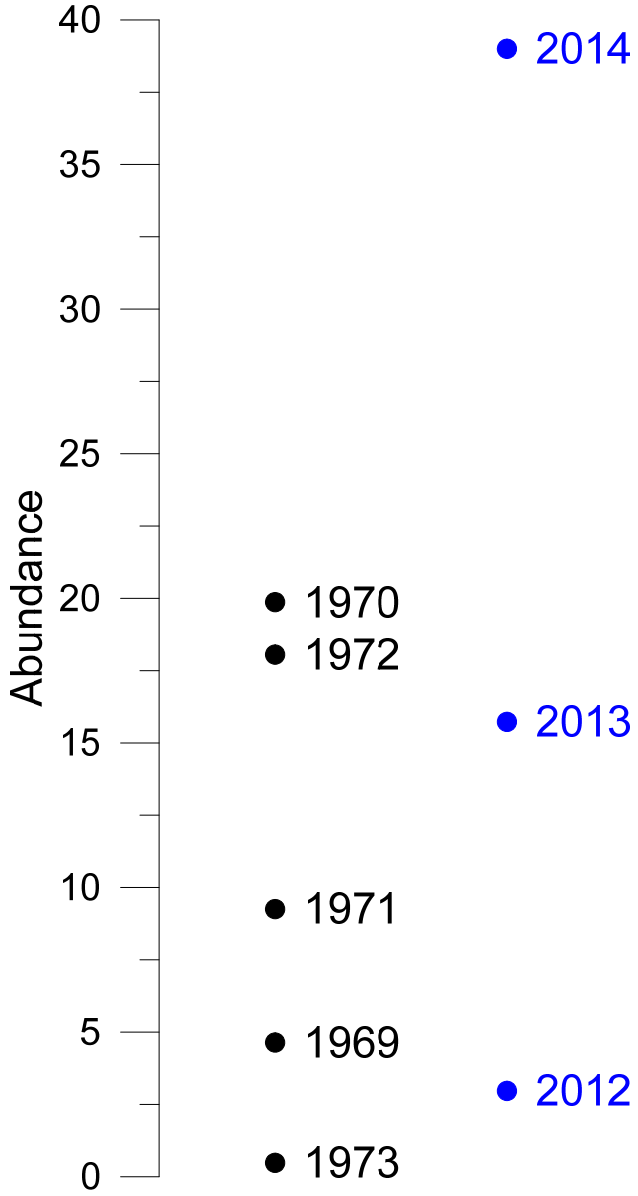
# What hinders comparing data sets?

## Changes in taxonomy




vs

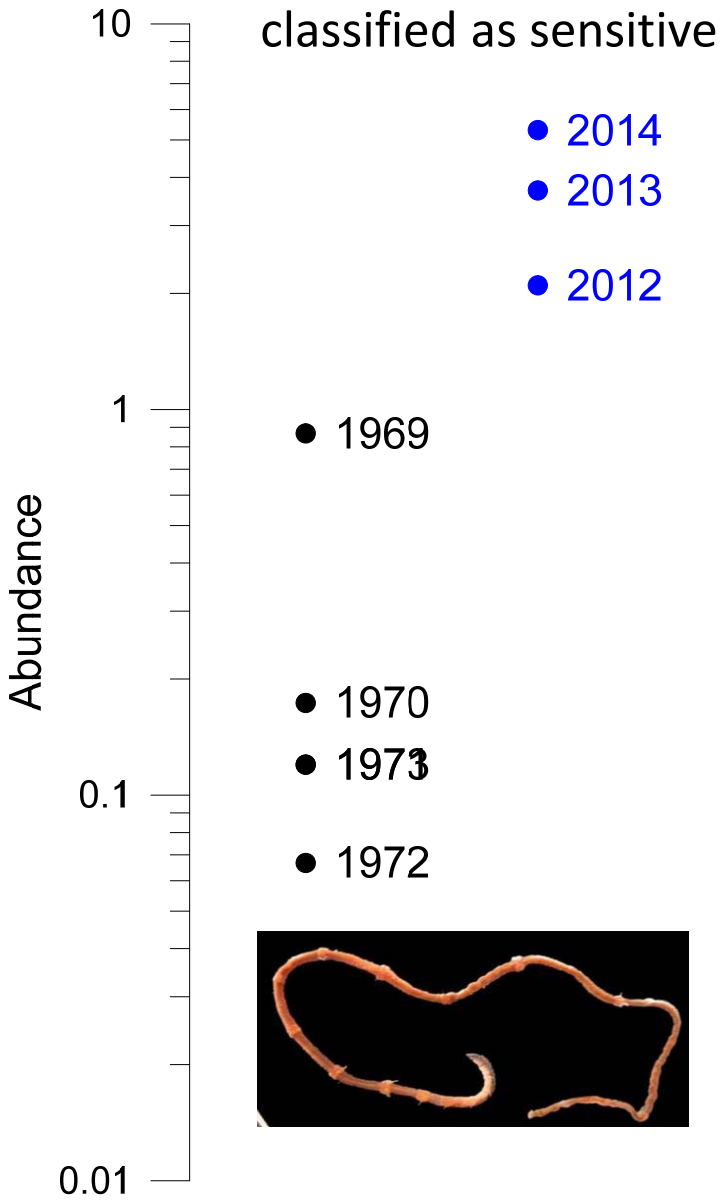
# How do abundances in the past compare with the present?



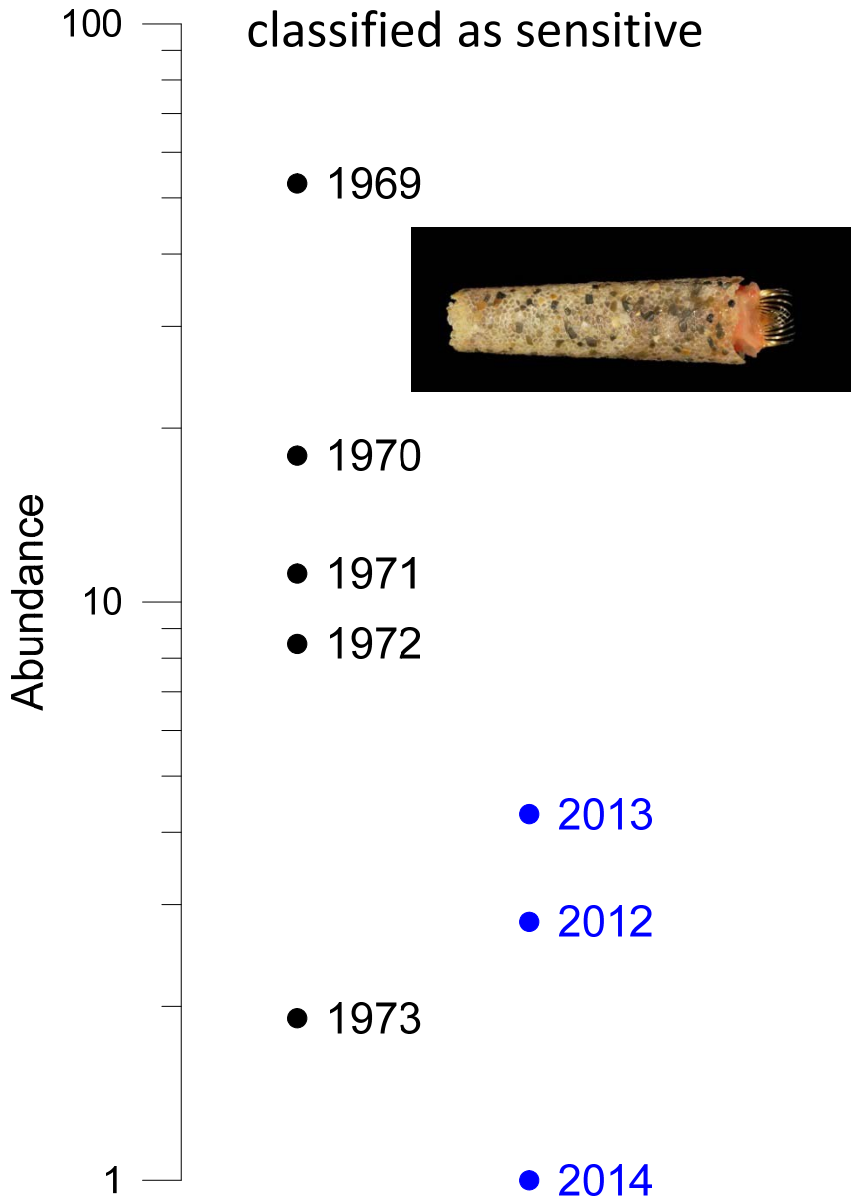

Four-eyed amphipod, classified as sensitive-to-tolerant

# How do abundances in the past compare with the present?

Bamboo worm,
classified as sensitive

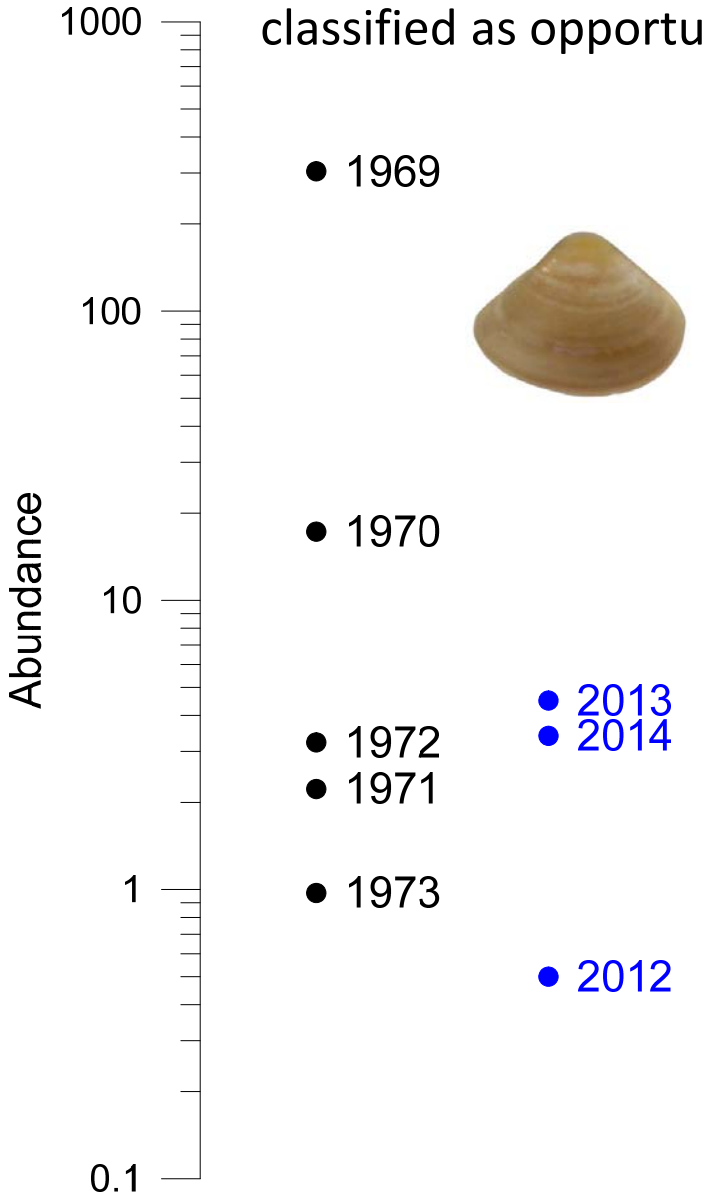



Ice-cream cone worm,
classified as sensitive



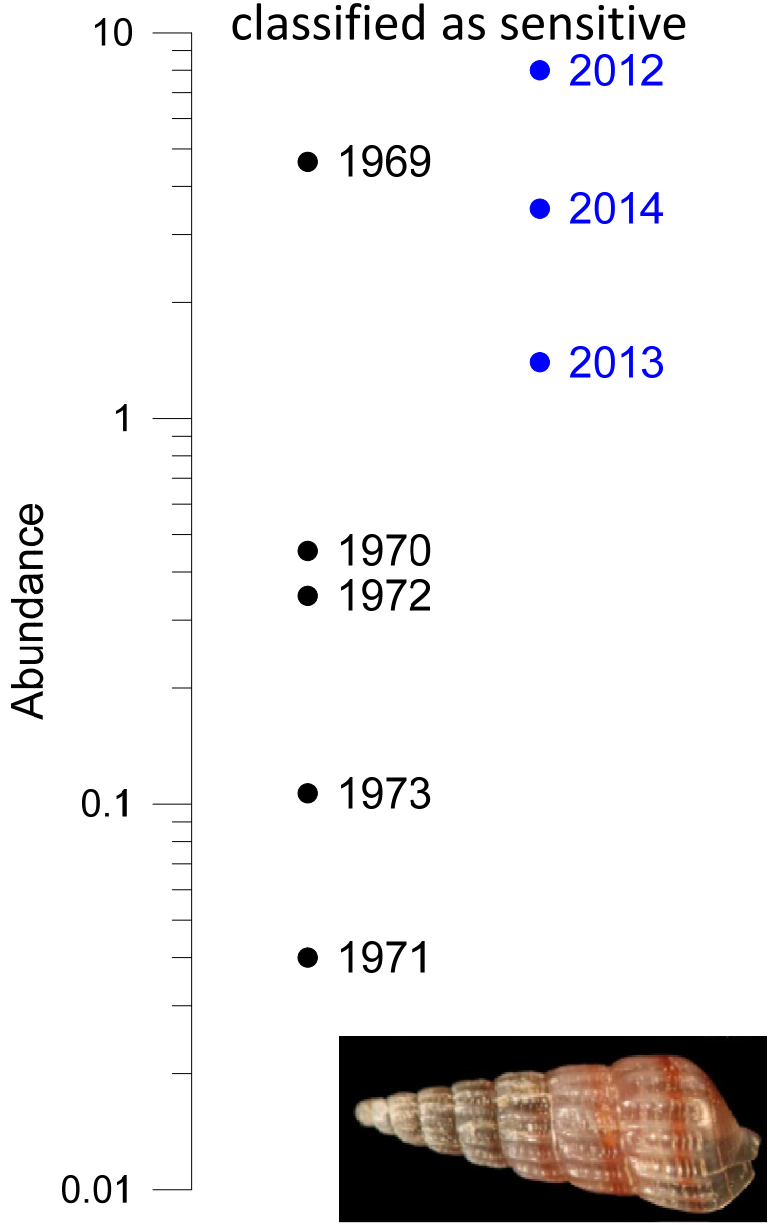
# How do abundances in the past compare with the present?

Dwarf surf clam,
classified as opportunistic

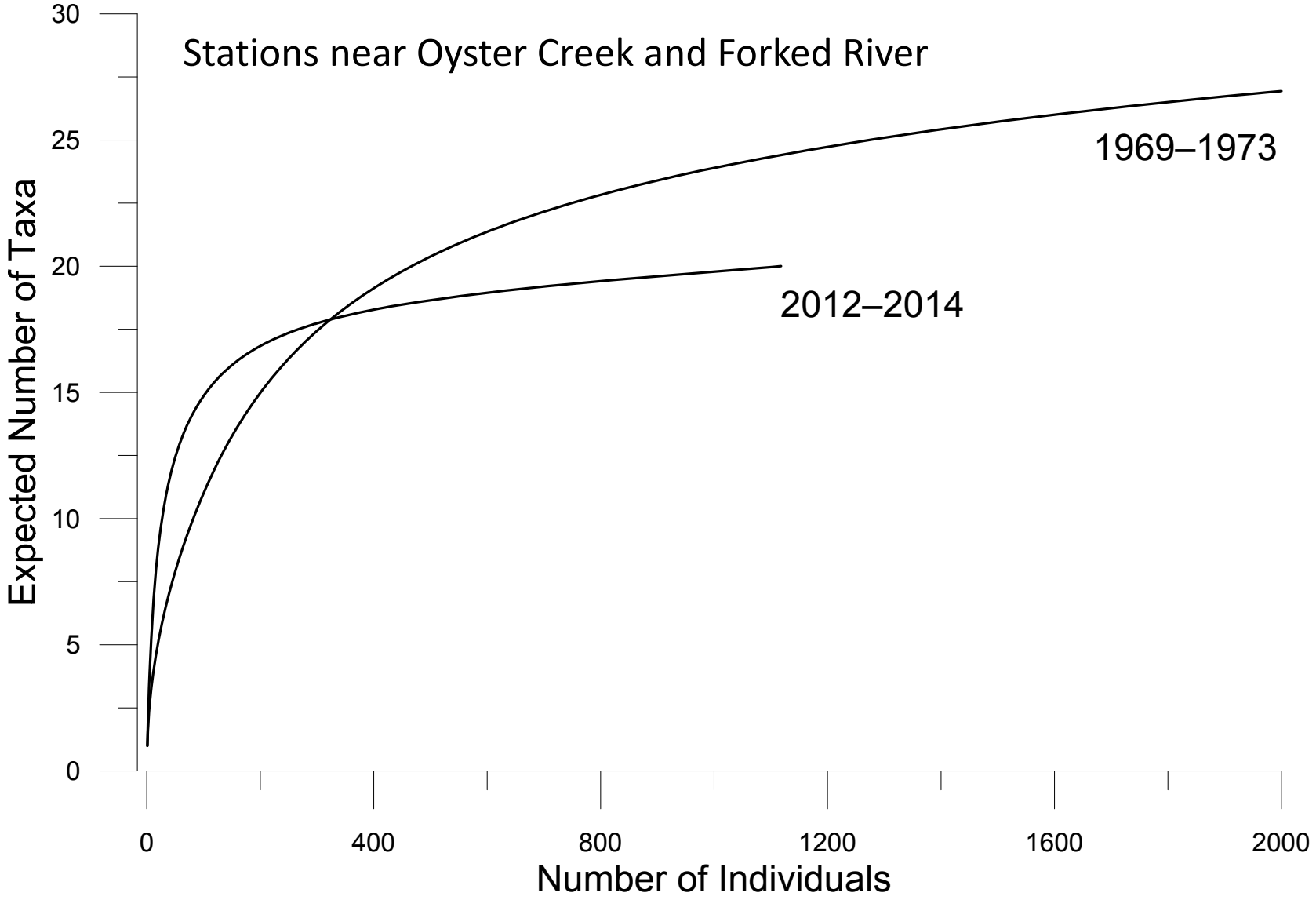


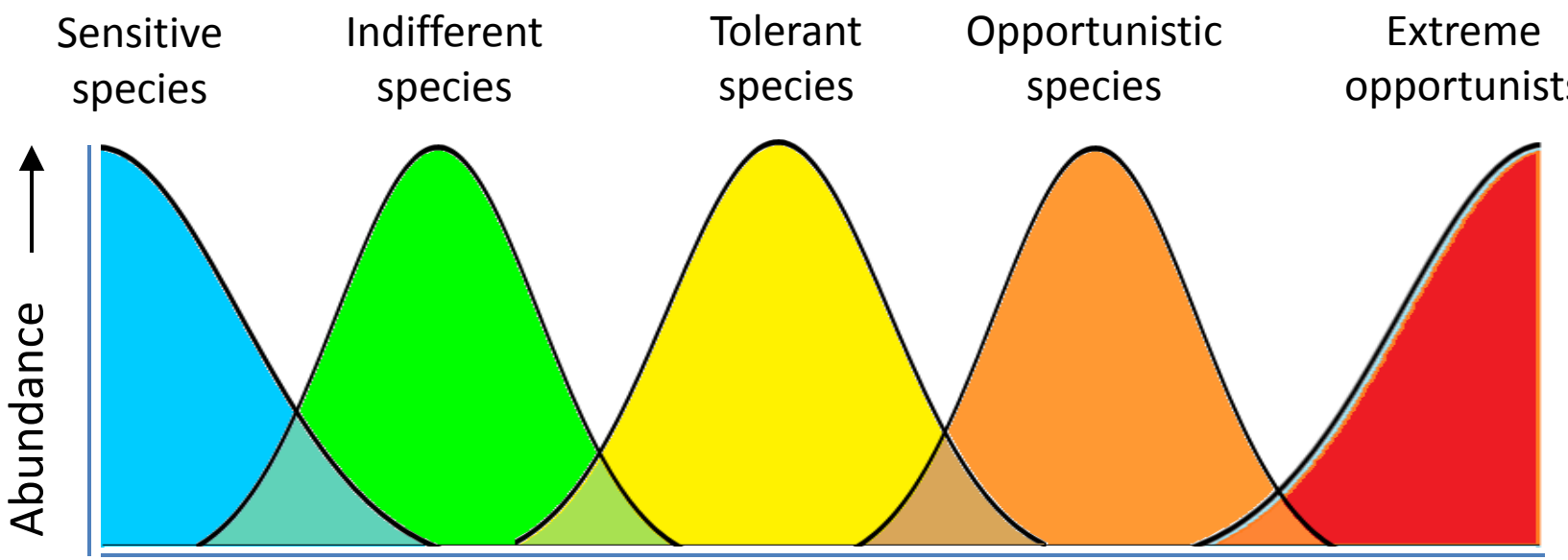


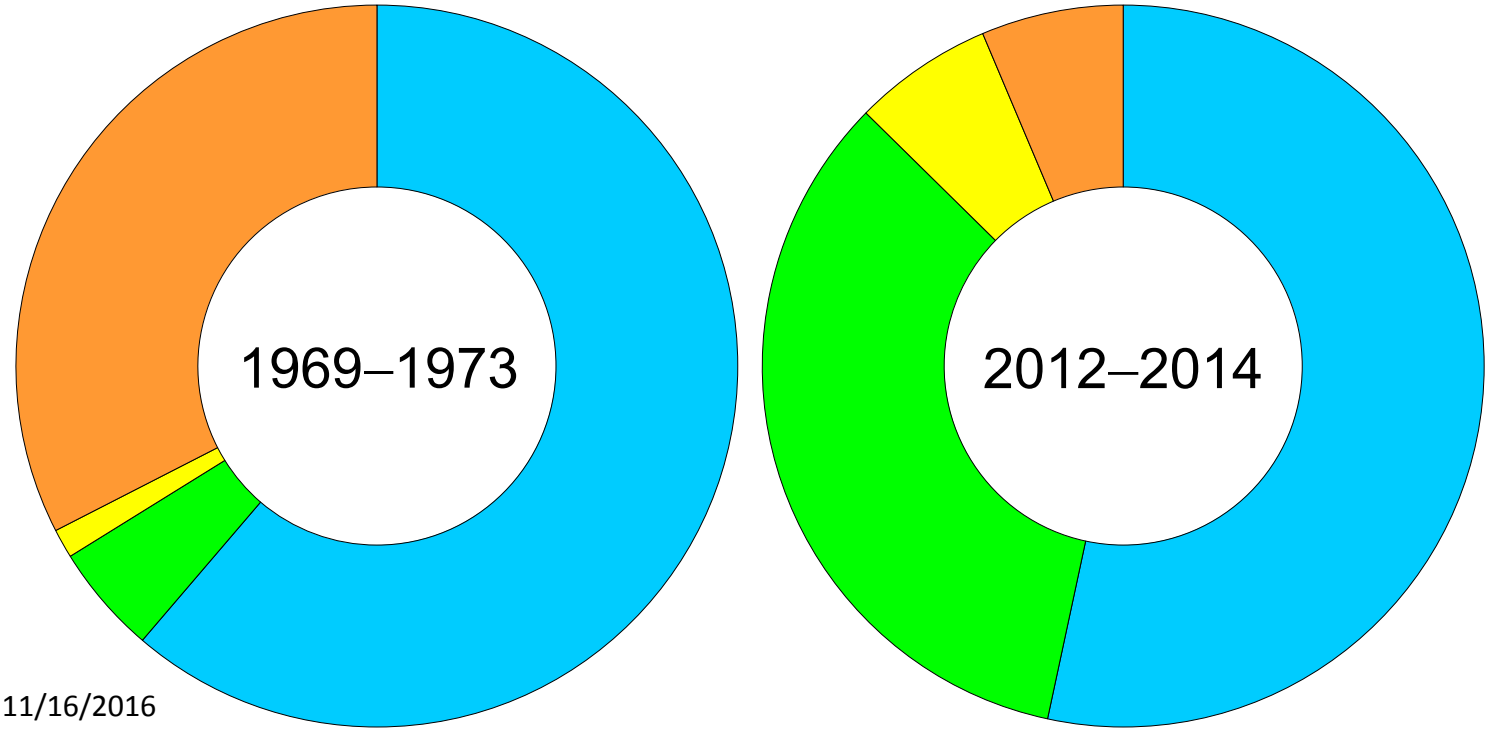

Interrupted turbonille,
classified as sensitive

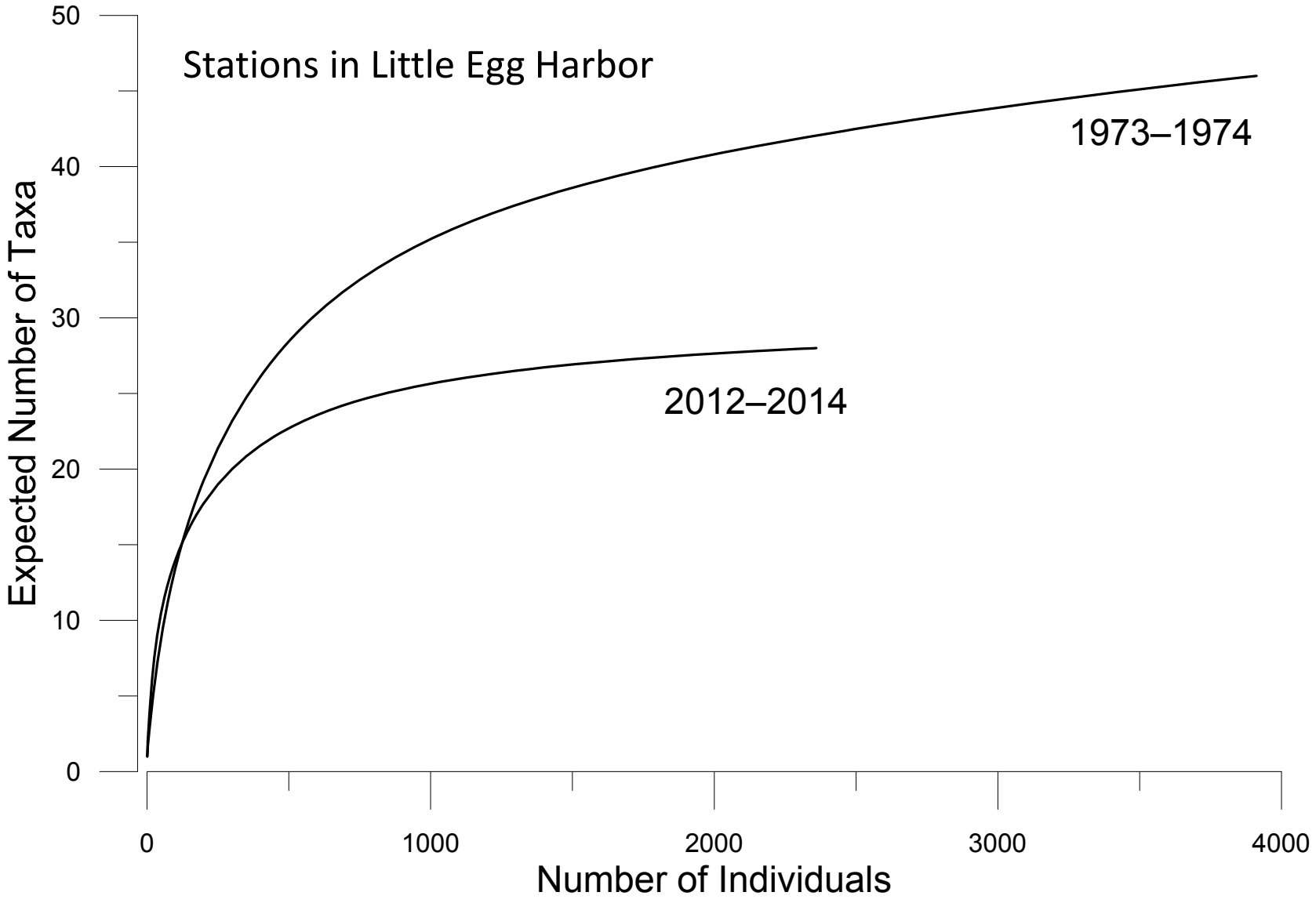


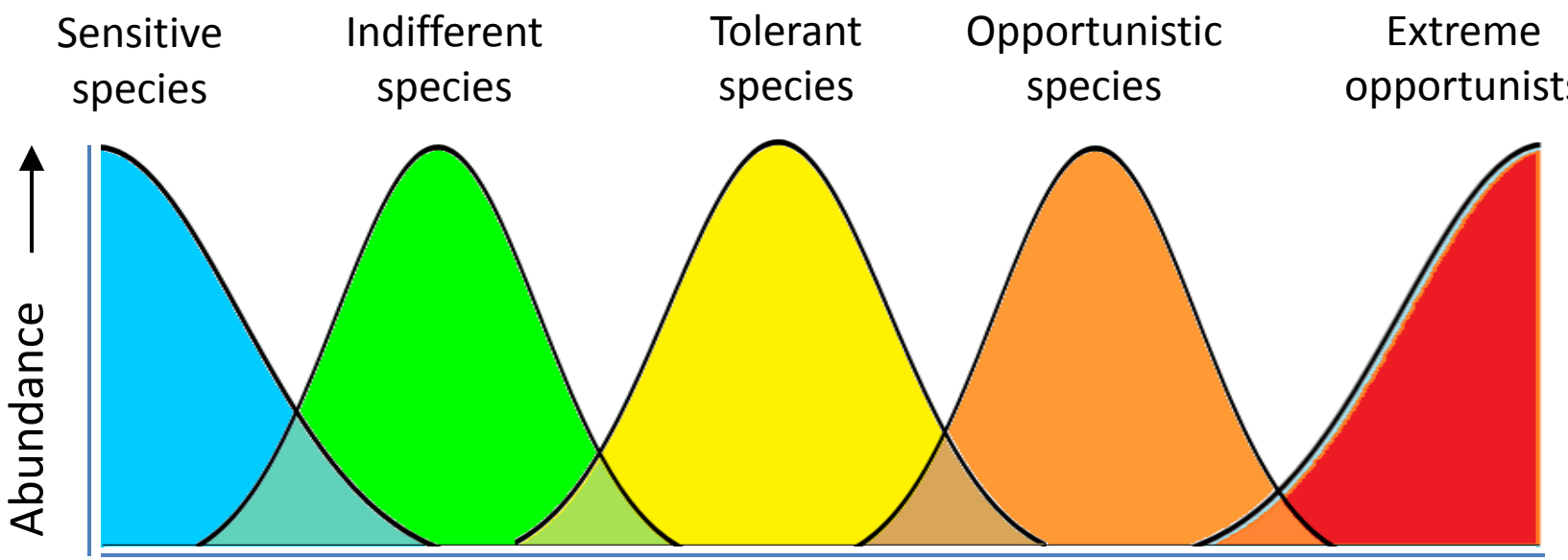
# “Rarefaction curves” allow comparison of species diversity between locations, time, or both




Sensitive species
Indifferent species
Tolerant species
Opportunistic species
Extreme opportunists
Abundance
Stressor (for example, organic enrichment)


1969–1973
2012–2014


Stations in Little Egg Harbor
1973–1974
2012–2014
Expected Number of Taxa
0
10
20
30
40
50
0
1000
2000
3000
4000
Number of Individuals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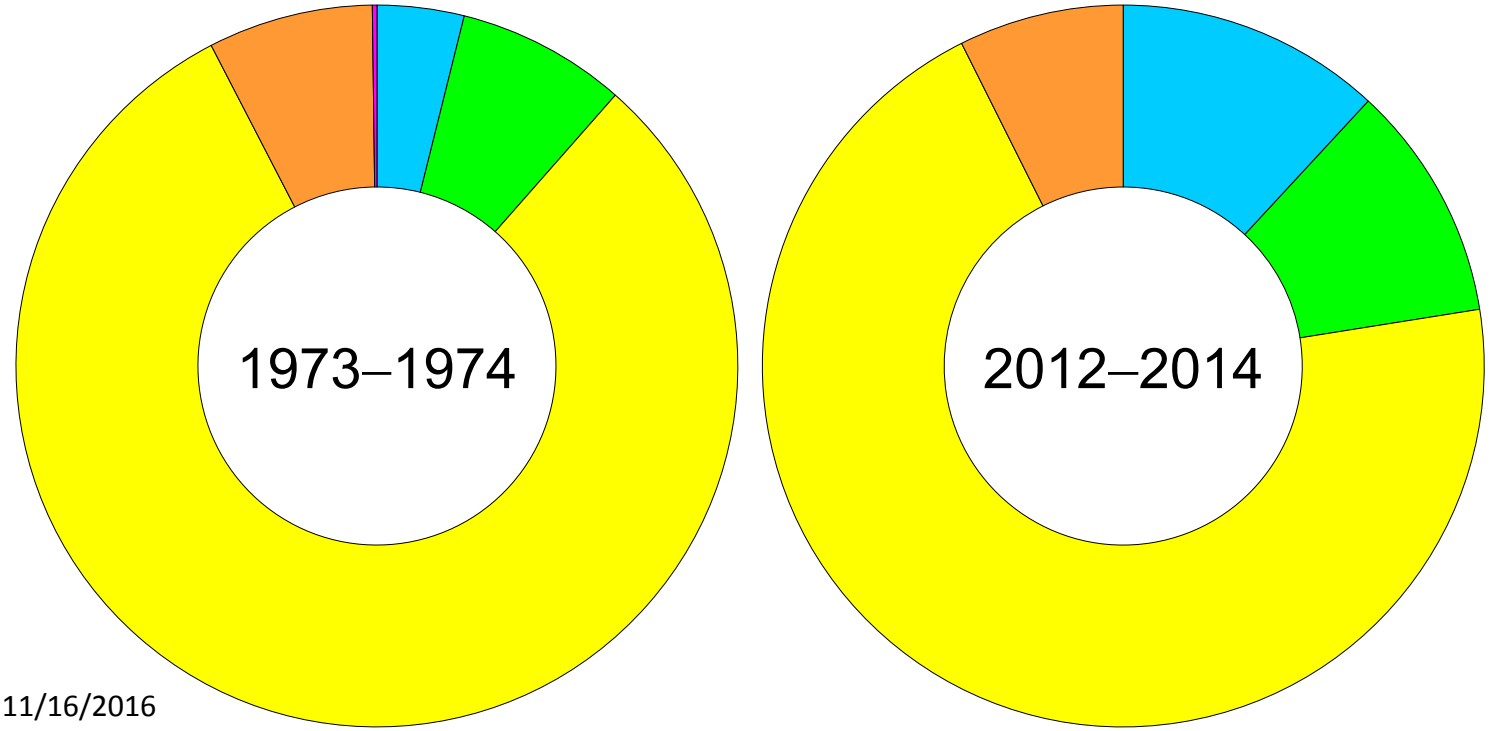
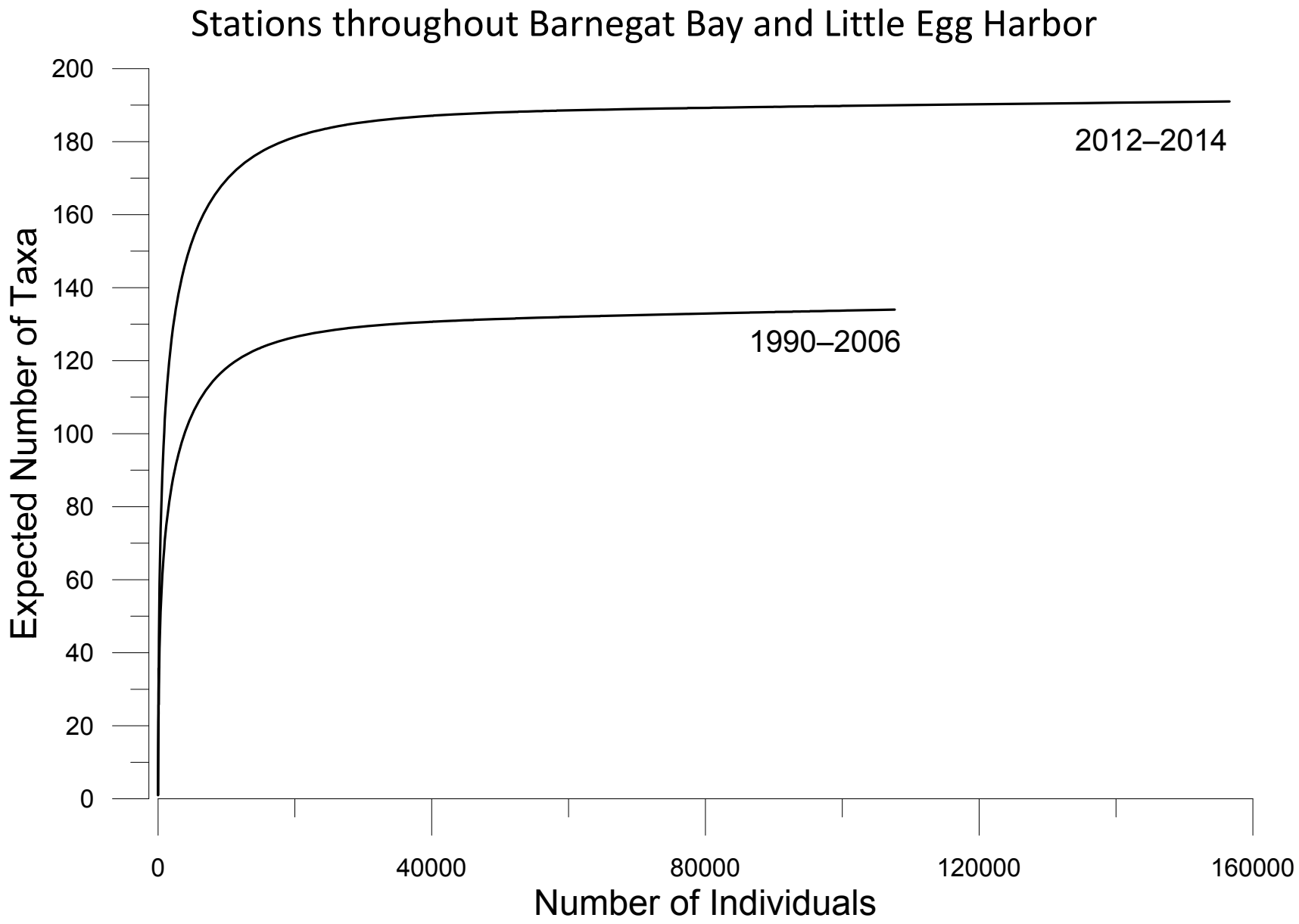
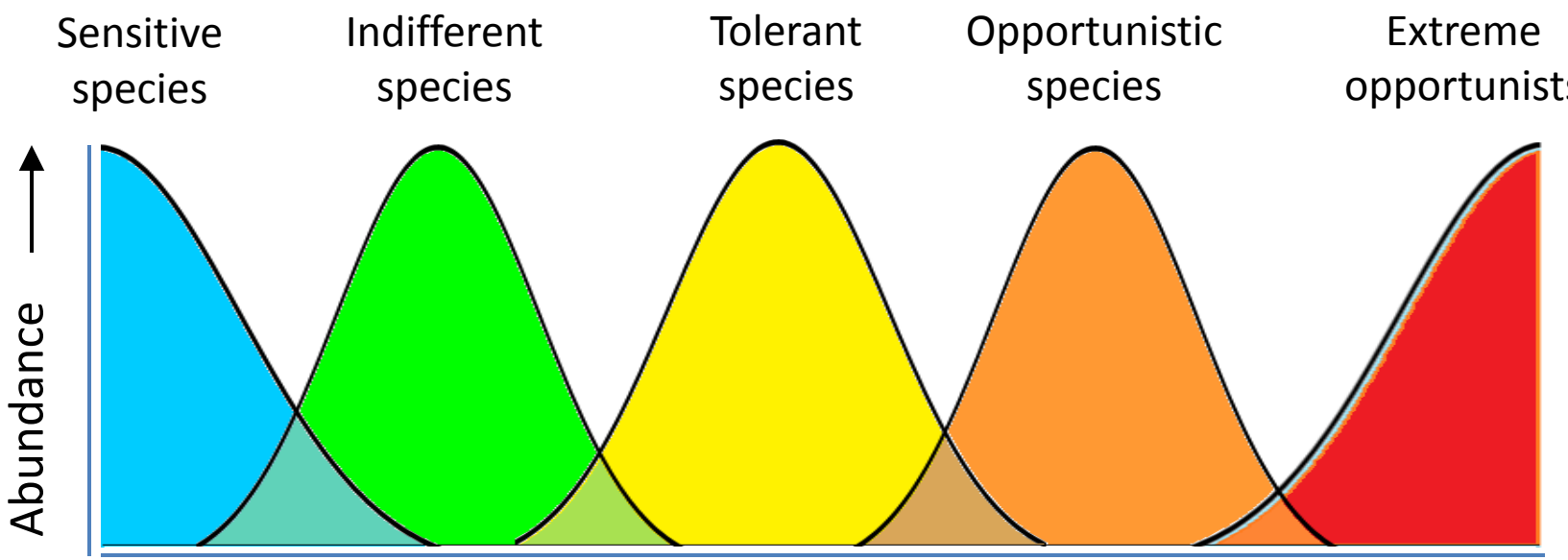

1973–1974
2012–2014


Stations throughout Barnegat Bay and Little Egg Harbor
Expected Number of Taxa
200
180
160
140
120
100
80
60
40
20
0
2012–2014
1990–2006
0
40000
80000
120000
160000
Number of Individuals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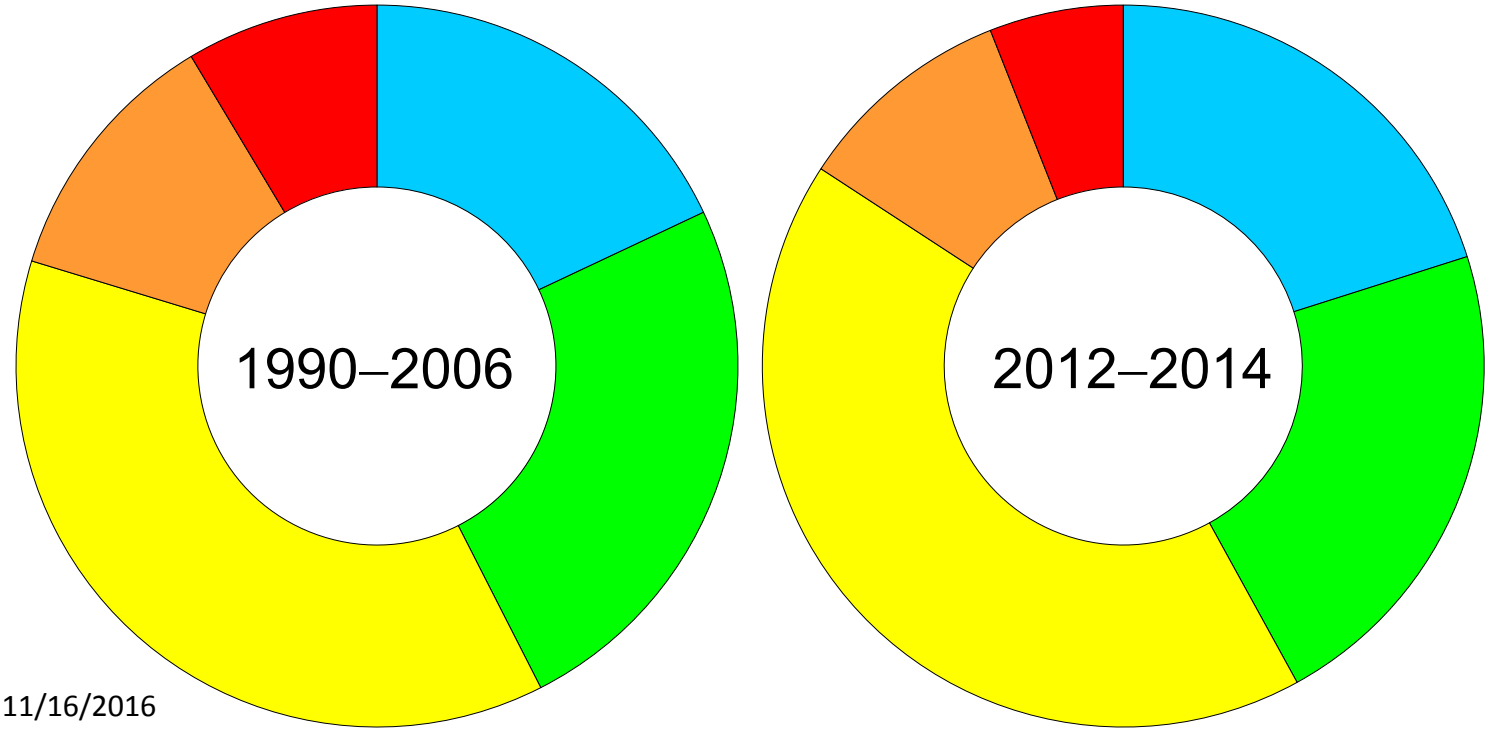
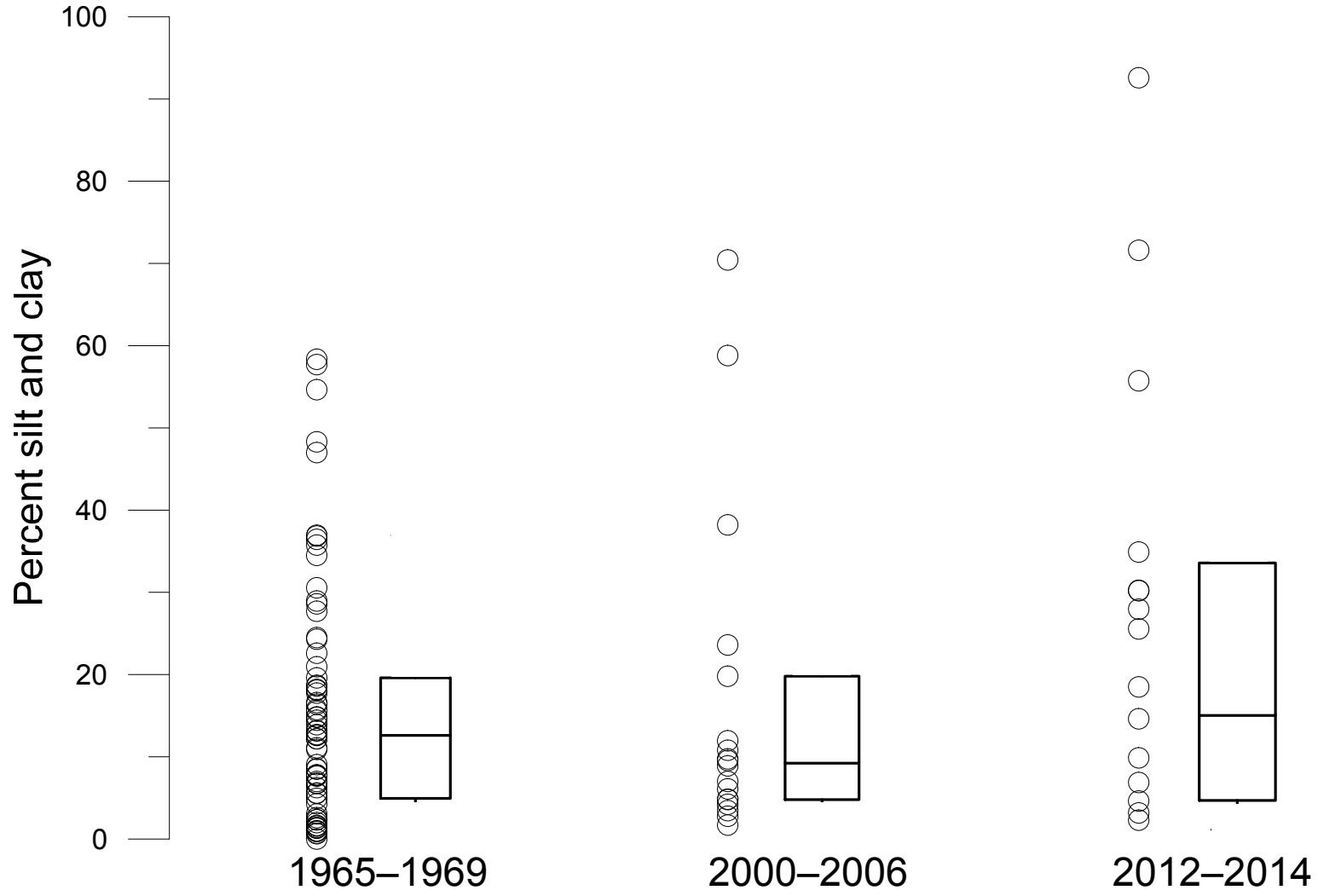
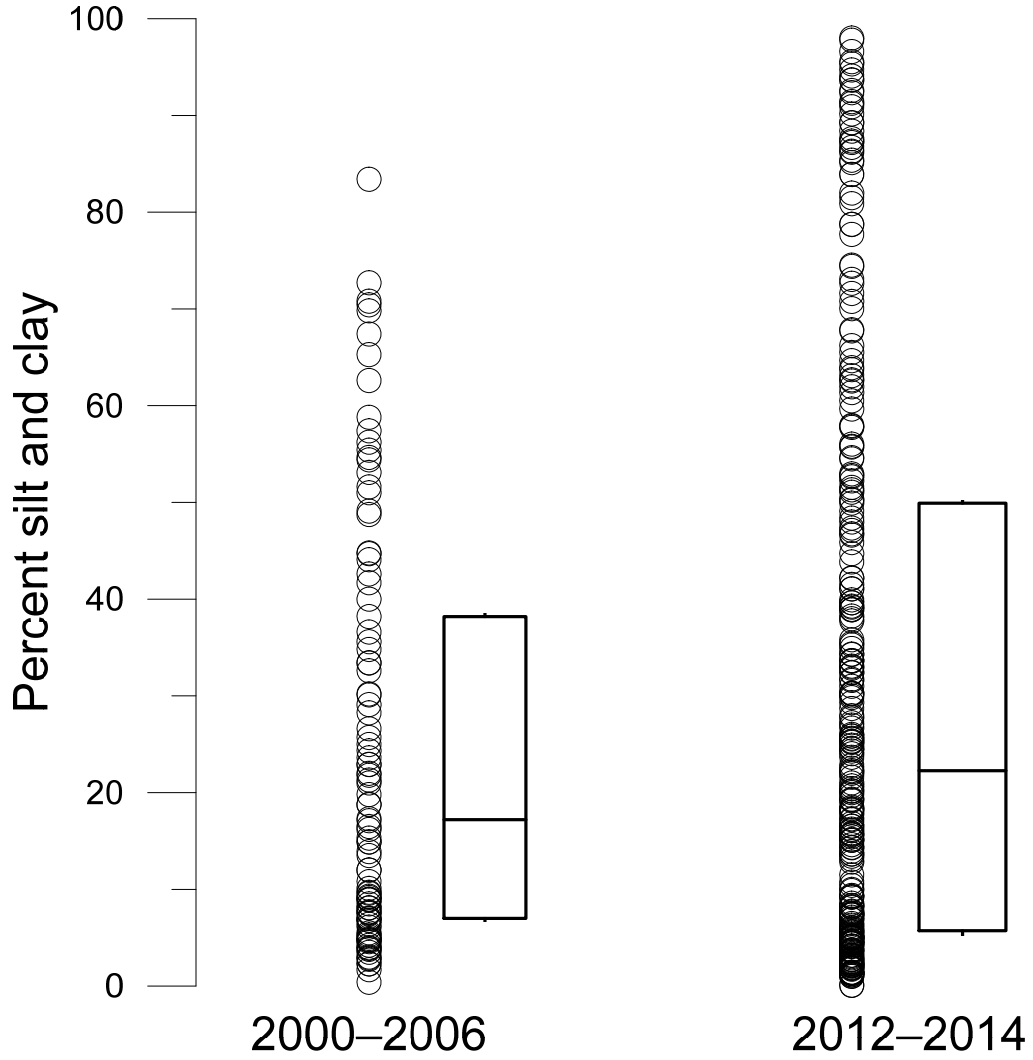

1990–2006
2012–2014

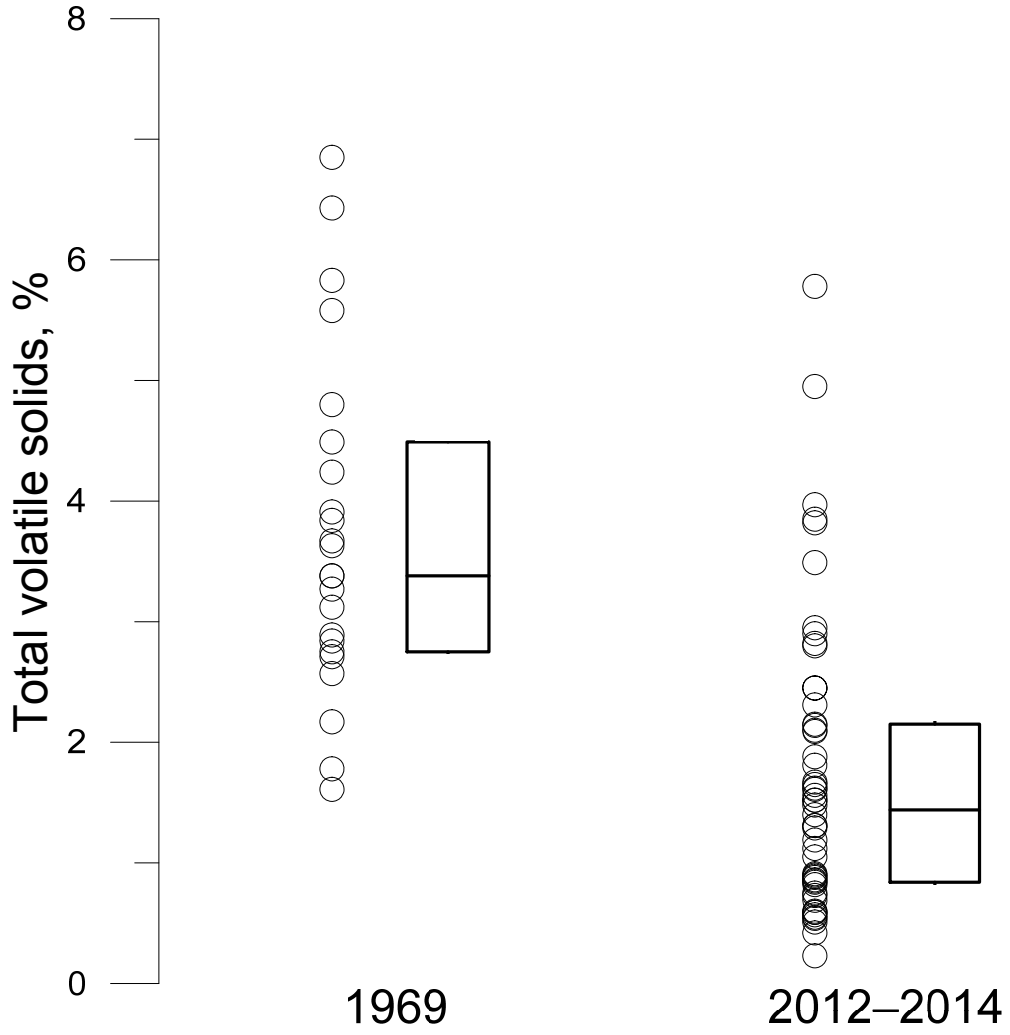
# Sediment particle size near Oyster Creek and Forked River has changed little if at all over past 49 years



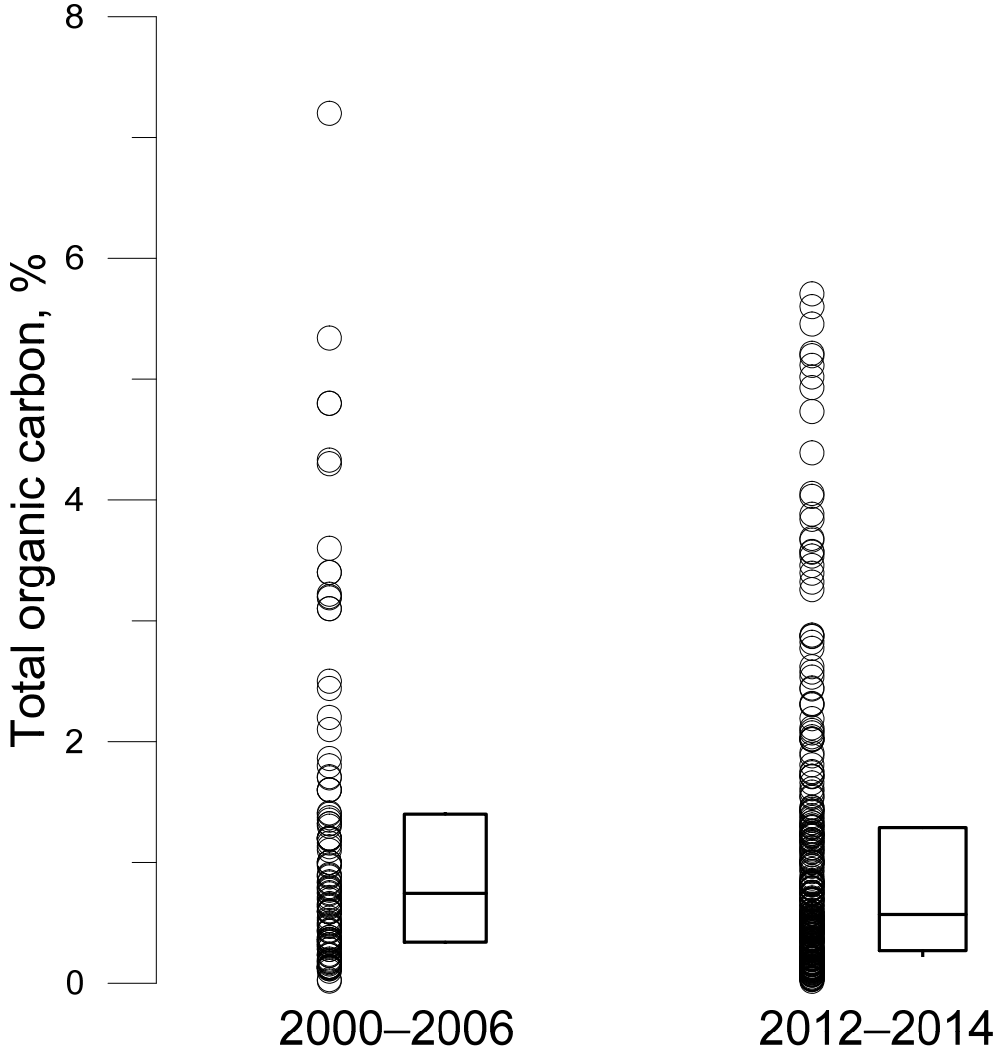
# Sediment particle size throughout Barnegat Bay – Little Egg Harbor has changed little if at all over past 14 years



# Sediment total organic content near Oyster Creek and Forked River has decreased over past 45 years



# Sediment total organic carbon throughout Barnegat Bay – Little Egg Harbor has not changed over past 14 years



# Conclusions

Compared with (limited) historical data from 49 years ago, the benthic invertebrate community today is nearly unchanged

Compared with (limited) historical data, sediment physical and chemical properties today are improved or similar

Based on the kinds and abundances of bottom-dwelling animals, habitat quality in Barnegat Bay-Little Egg Harbor is good to high