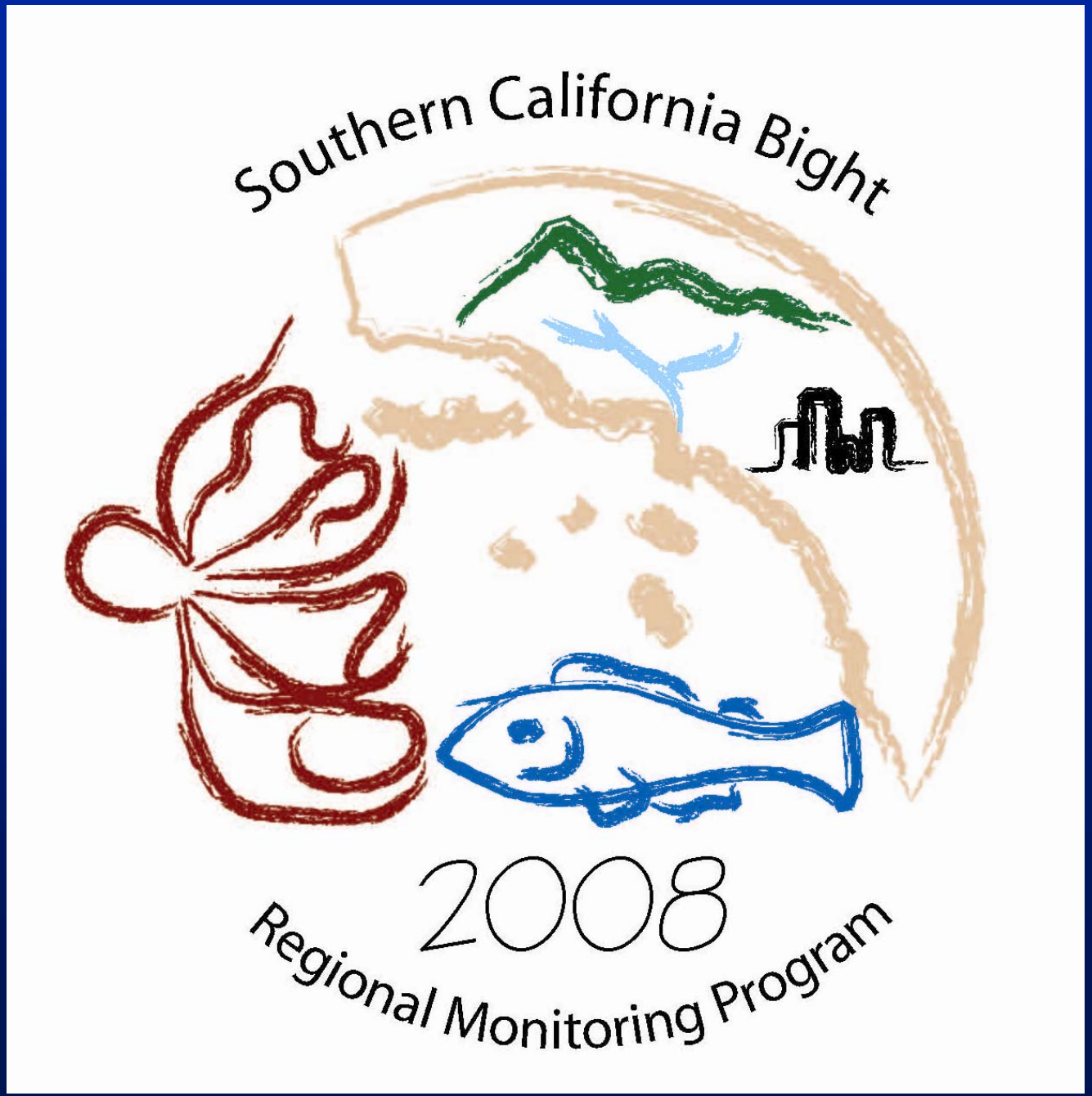

Southern California Bight
2008
Regional Monitoring Program

Bight ‘08 Coastal Ecology: Sediment Contamination

Regional Sediment Contaminant Monitoring Is Growing and Evolving

- Three Bightwide surveys thus far
  - 1994, 1998, 2003
- Consistently increasing participation
  - Collaborating agencies has grown from 12 to 60+
- Steadily expanding focus
  - Questions to answer
  - Habitats assessed
  - Measurements taken

What Do We Still Need To Learn?

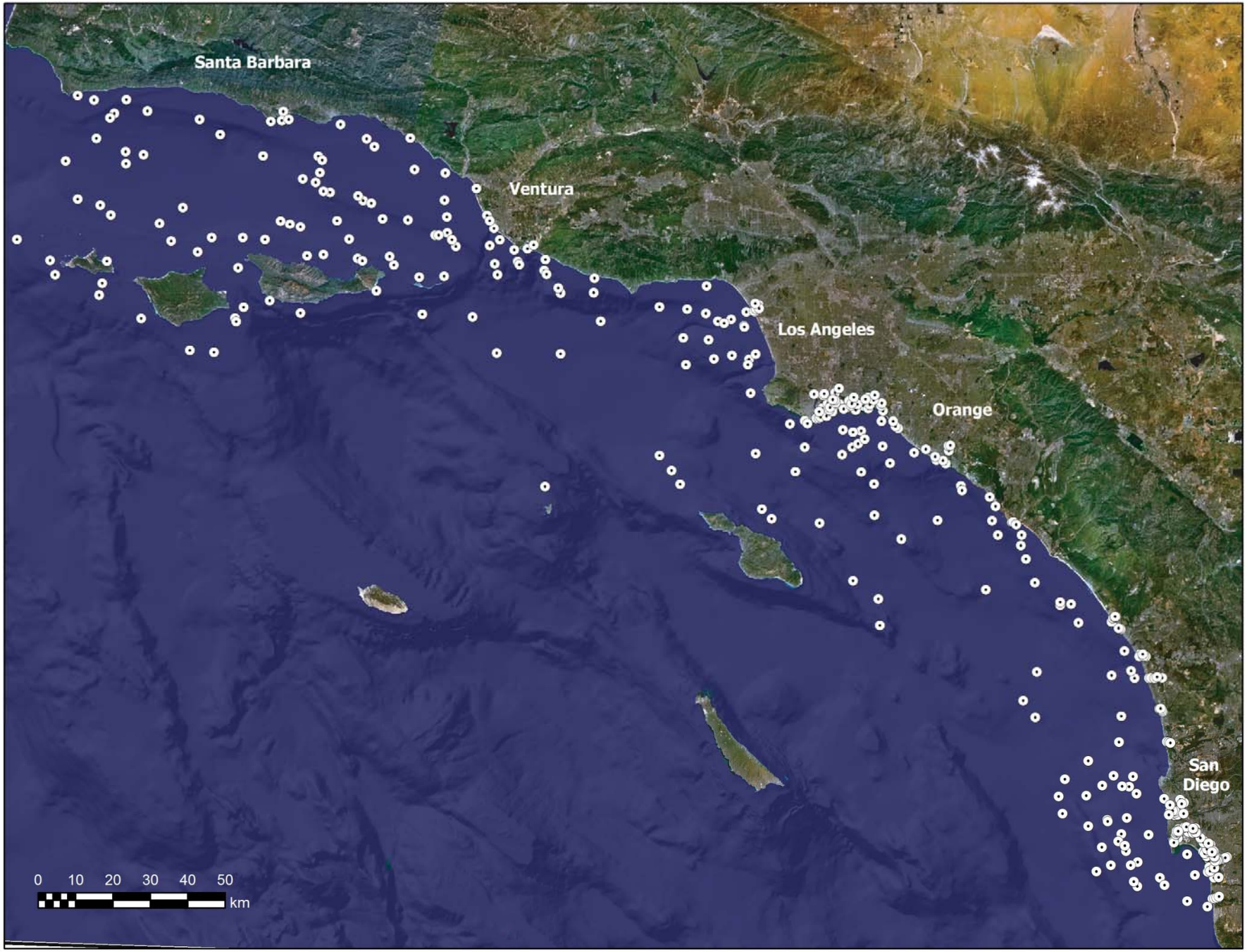
- Most of your day to day monitoring effort is very localized
  - Lack recent information on regional condition for context
- Trend information focused near your discharges
  - Large scale trends in sediment condition has not been quantified
- State recently adopted sediment quality objectives (SQO)

Bight '08 Sediment Contamination Regional Monitoring Questions

- What is the extent of pollutant impacts in the Southern California Bight?
- How does the extent of impact differ between habitats of concern?
- Are the impacts increasing or decreasing with time?

Bight '08 Sediment Methods Summary

- **Probability based design**
  - Enables unbiased estimates of extent and magnitude
- **Six Offshore habitats**
  - inner/middle/outer continental shelf, slope, basin, Channel Islands
- **Four embayment habitats**
  - Estuaries, marinas, ports, open bays
- **Four indicators of pollutant impacts**
  - Sediment chemistry, toxicity, infauna, trawls


Santa Barbara
Ventura
Los Angeles
Orange
San Diego
0 10 20 30 40 50
km

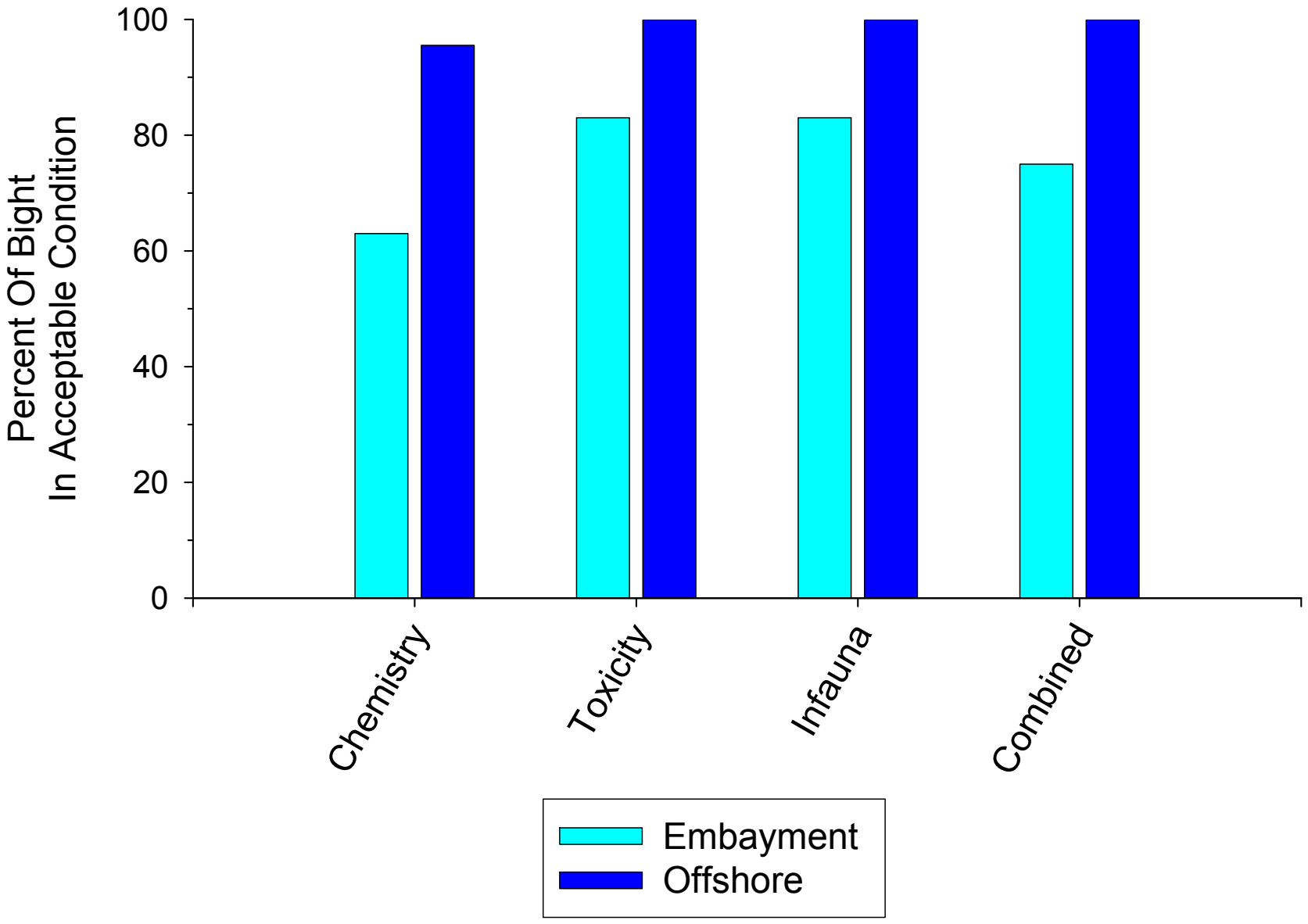
Assessment Methods

- Bight program helped develop the multiple line of evidence approach adopted by SWRCB's sediment quality objectives
- Multiple lines of evidence Combines chemistry, toxicity, and infauna
- Sediment quality objectives was designed for embayments
  - We adapted it for offshore
  - Continental shelf, but not deep waters of slope or basin

Bight'08 Sediment Contamination Answers

- Vast majority of Bight sediments are considered unimpacted
- Where impacts occur, they are disproportionately found in embayments
  - Particularly in estuaries and marinas
- Embayments have been improving over last decade

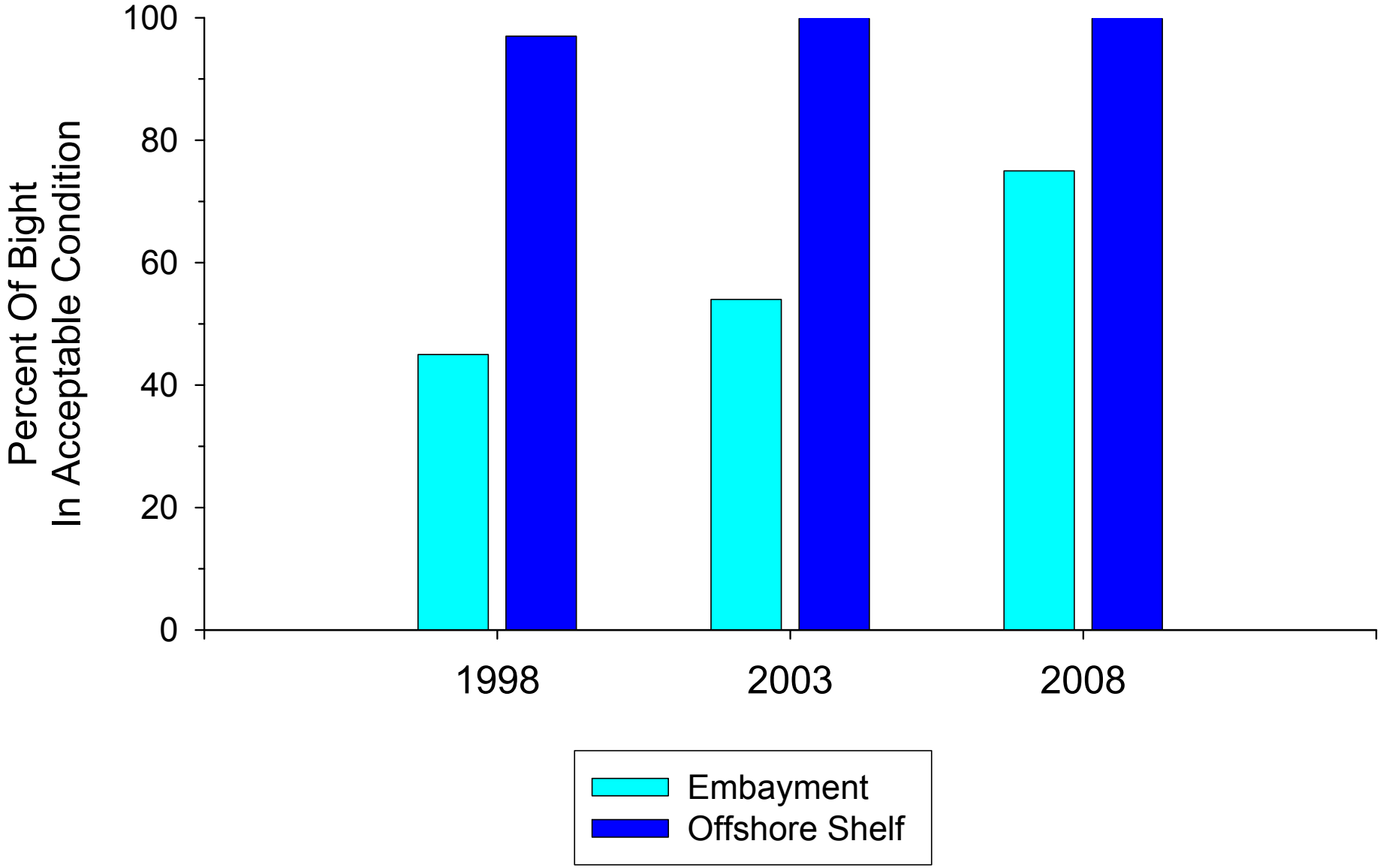
Bight '08 Results



Comparison Among Embayment Habitats

	Percent of Area In Acceptable Condition
Estuary	50%
Marina	45%
Port	77%
Open Bay	80%
All Embayment	75%

Condition Change Over Last 10 Years (Combined Indicators)



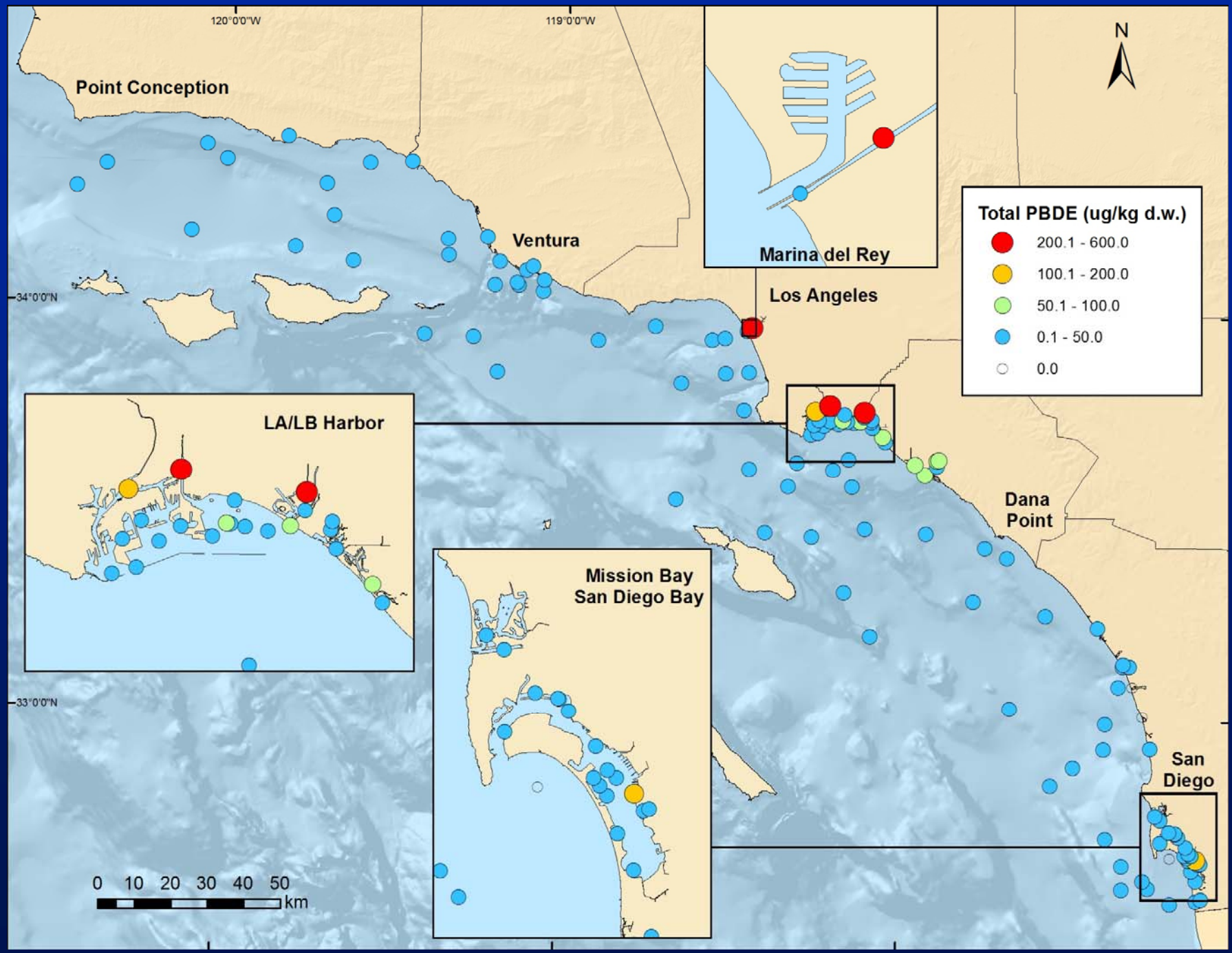
Bight Is Also a Unique Platform for Exploratory Studies

- Constituents of emerging concern
- Bioaccumulation in sportfish
- Contamination on the continental slope and basin

Emerging Contaminants Are Not Routinely Monitored

- **Polybrominated Diphenyl Ethers (PBDEs)**
  - Flame retardants that bioaccumulate like PCBs
- **Pyrethroid pesticides**
  - Can be acutely toxic to non-target organisms
- **How widespread are emerging contaminants?**
  - Regional monitoring provides context for concern

Flame Retardants (PBDEs) In the Southern California Bight



Pyrethroid Extent, Magnitude and Accumulation

Embayment Habitat	Percent Area with Detectable Concentrations	Mean Concentration (ug/kg)	Accumulation Factor (kg/km^2)
Estuary	49	22	1.64
Marina	65	20	1.50
Bay	36	2.3	0.21
Port	16	0.2	0.02
All Embayments	35	5.2	0.39

Last Bightwide Bioaccumulation Survey was 20+ Years Ago

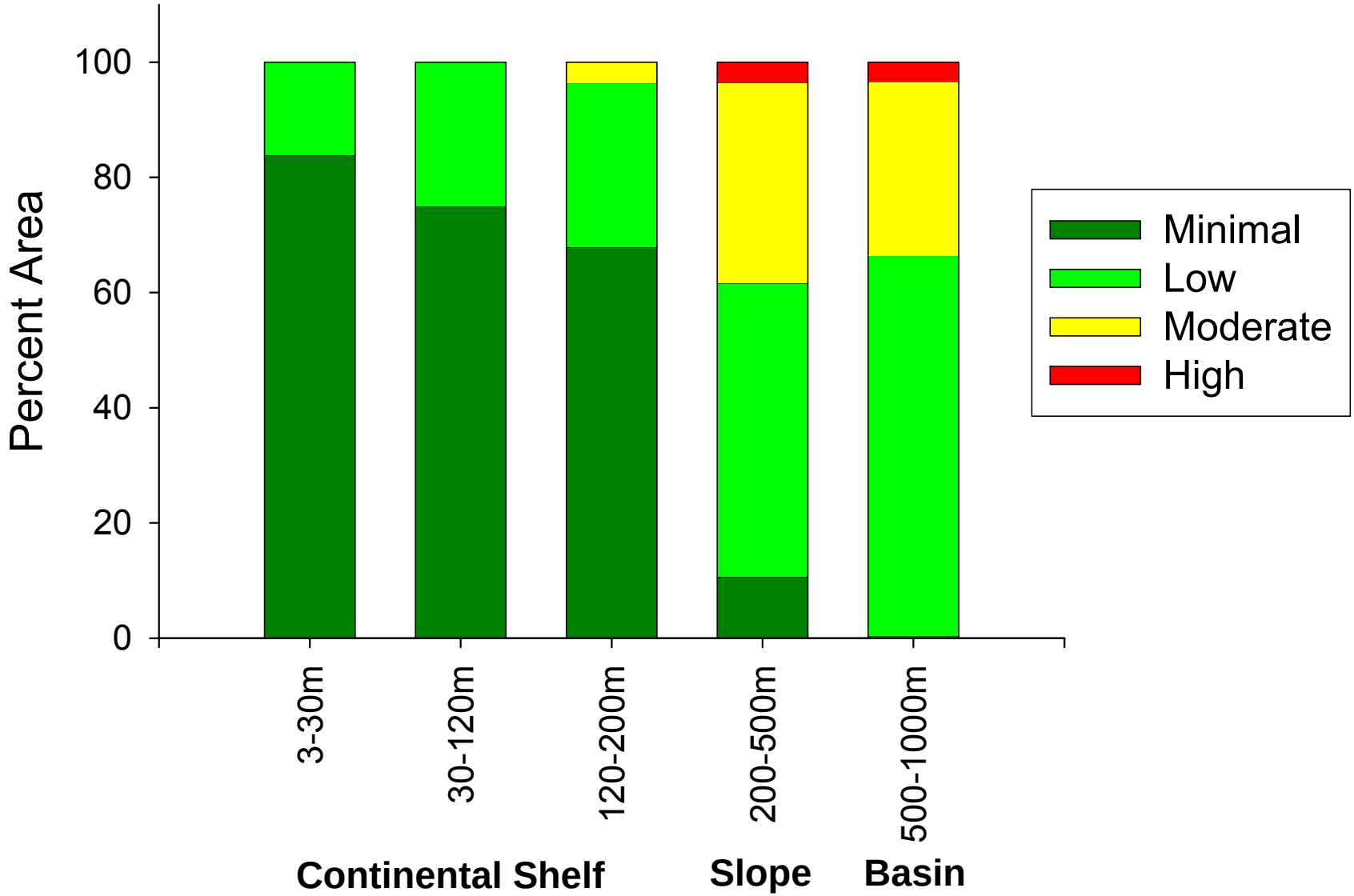
- What proportion of popular sport fishing areas have low enough concentrations for safe consumption?
  - What is the regional distribution of tissue concentrations?
- Collected more than 1,000 of the most commonly caught sportfish
  - 30 zones from San Diego to Goleta
- Analyzed filets for the greatest chemical threats to anglers
  - Compared to State fish advisory thresholds


Total PCB
Total DDT
Total Mercury
0
20
40
60
120
0
20
40
60
80
1000
2000
0
100
200
300
400
500
No consumption
Advisory Tissue Level (3 8-oz servings/wk)
Santa Barbara County
Ventura County
Los Angeles County
Orange County
San Diego County
N. Channel Isl
Gaviota
SB Oil Pltfrm
Santa Barbara
Ventura
Catalina Isl
Pt Dume
Malibu
Playa Vista
Redondo
Palos Verdes
OC Oil Pltfrm
North OC
Middle OC
South OC
SD North Co
La Jolla
Point Loma
Tijuana

Deep Ocean Is Largely Unmonitored

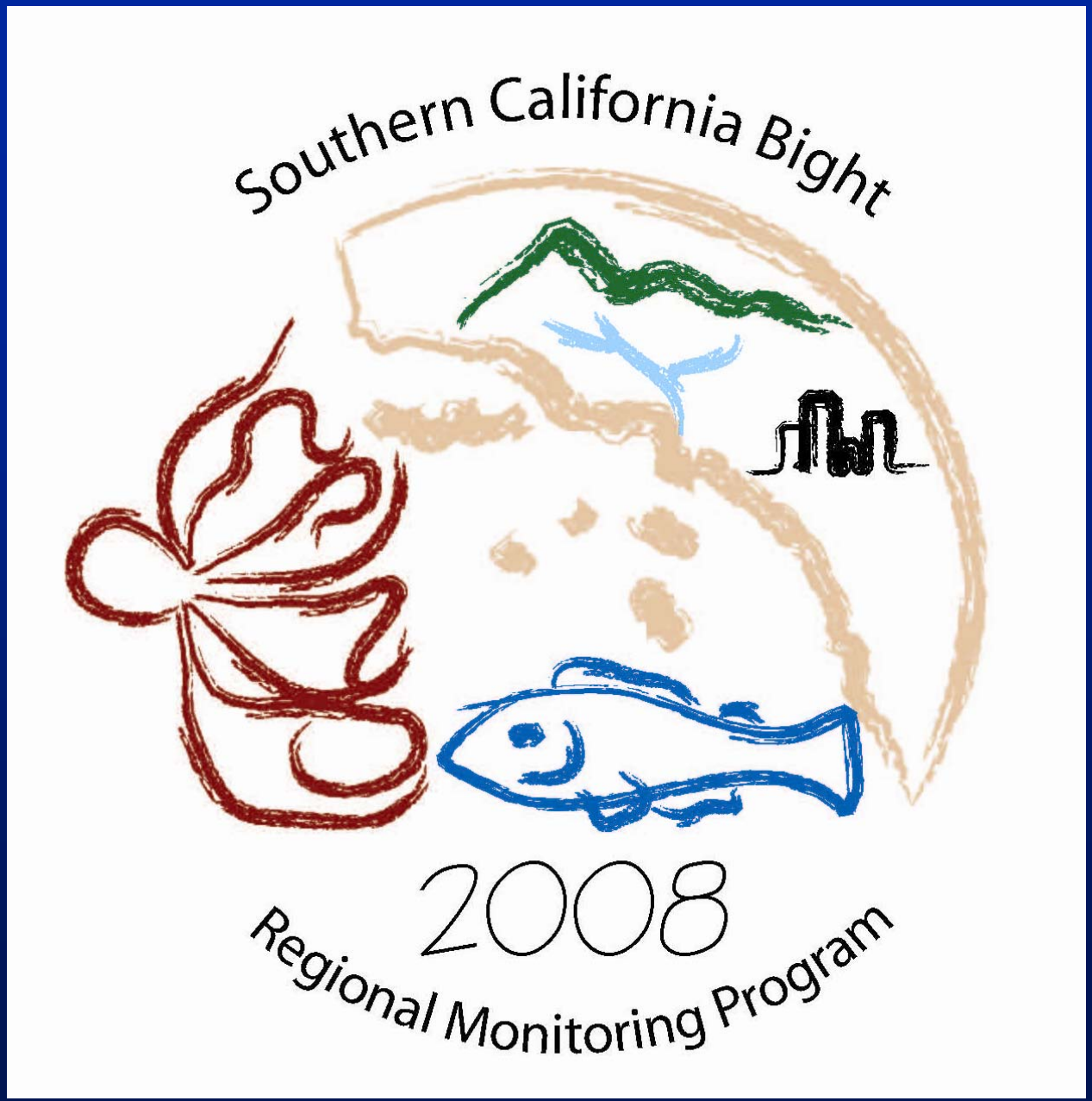
- None of the routine monitoring programs sample the continental slope and basin
  - Up to 1,000 m deep
- Biology is not well known
  - Bight ‘08 identified 34 new species in this unique habitat
- Does land-based discharges accumulate in the deep ocean?

Magnitude and Extent of Contaminant Exposure



Our Next Steps

- Continued work in estuaries, one of the most impacted habitats
- Looking to develop/refine assessment tools for grading sites
  - Deep oceans, non-saline estuaries
- Focused work on Constituents of Emerging Concern
  - Biological exposure and effects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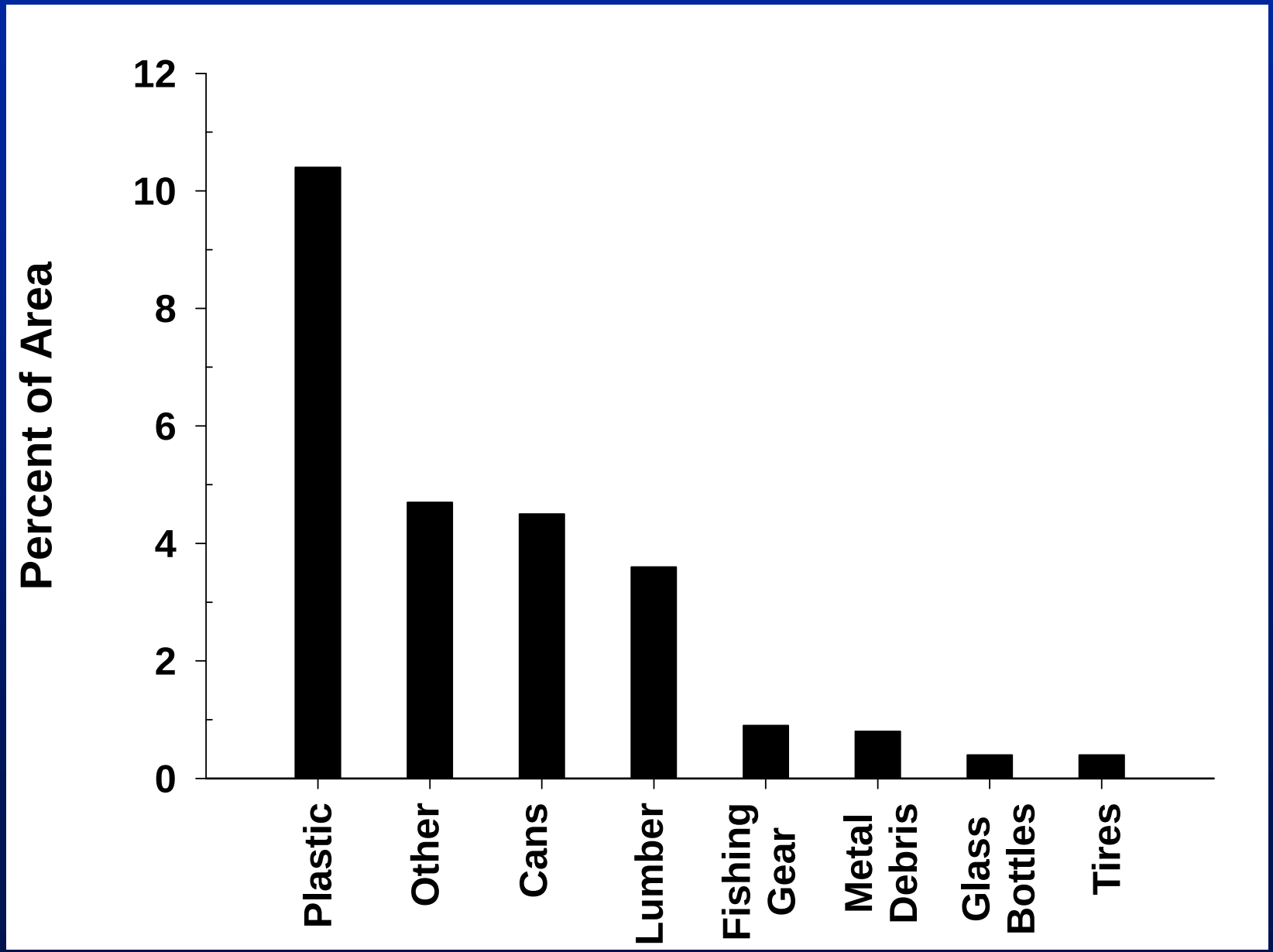
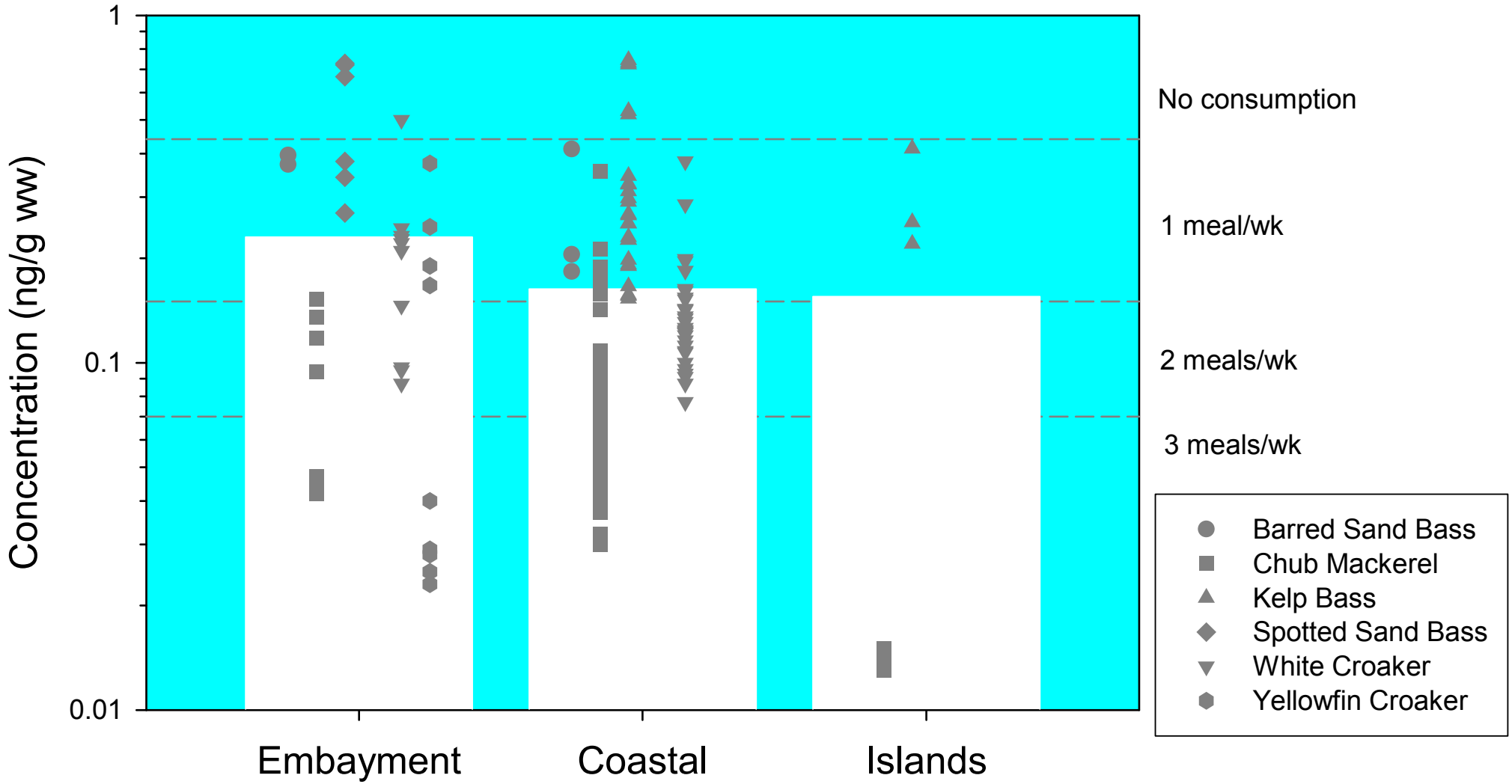
Percent of Continental Shelf Area with Debris

Bight Survey Year	Anthropogenic Debris	Natural Debris	Any Debris
1994	14	73	75
1998	23	88	89
2003	25	40	50
2008	21	64	71

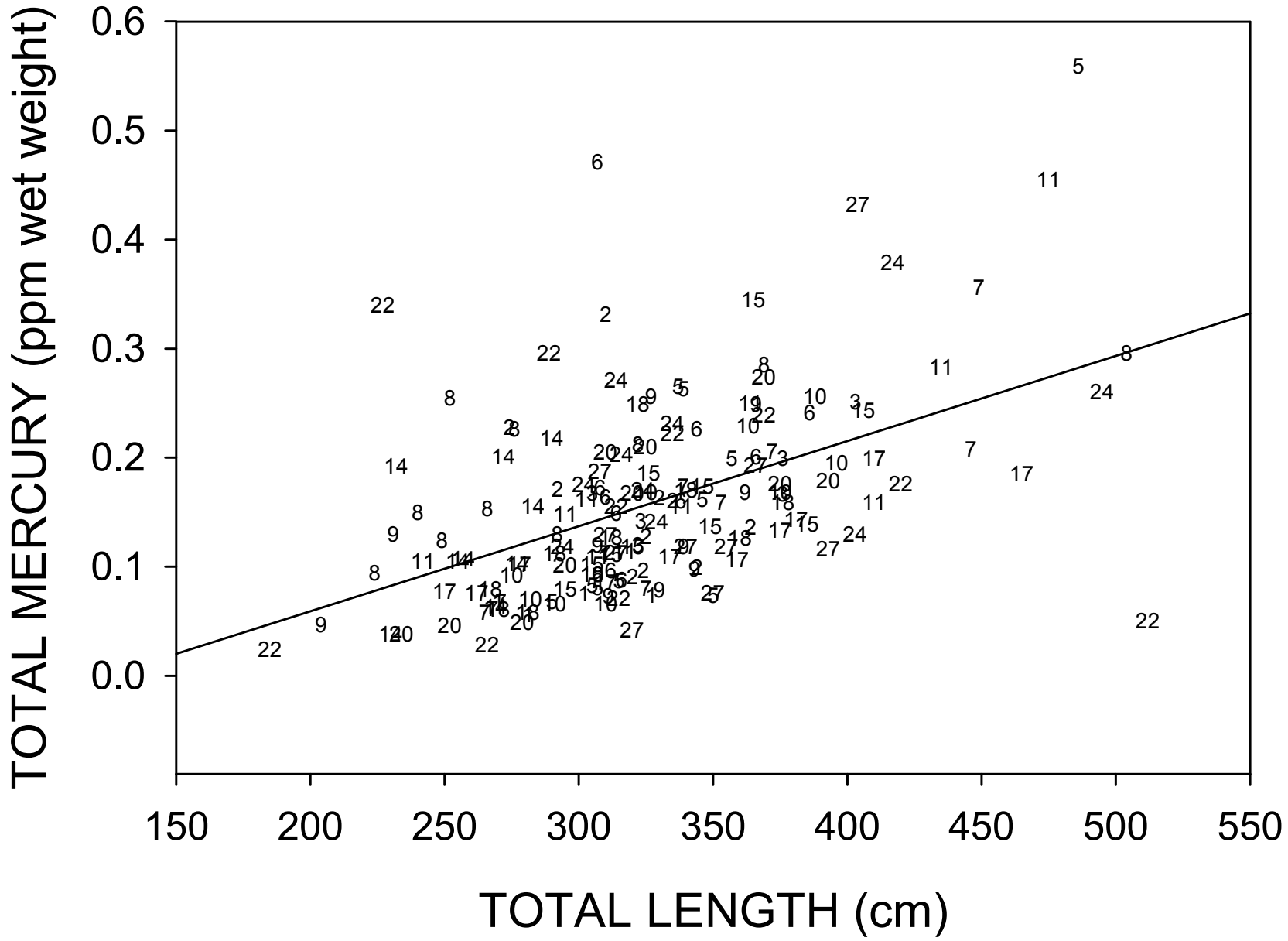
Extent Of Anthropogenic Marine Debris Types



Total Mercury In Edible Tissues of Southern California Sportfish



KELP BASS


TOTAL MERCURY (ppm wet weight)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
150
200
250
300
350
400
450
500
550
TOTAL LENGTH (cm)

Sediment Concentrations on the Continental Margin

	Inner Shelf (0-30m)	Middle Shelf (30-120)	Outer Shelf (120-200)	Slope (200-500)	Basin (500-1000)
Fines	22	47	60	81	90
Copper	4	11	12	23	35
Lead	5	8	9	15	16
Zinc	25	46	52	79	96
Total DDT	20	16	56	238	165
Total PCB	10	13	19	36	11
Total PBDE	0.2	2.2	2.0	4.3	4.9

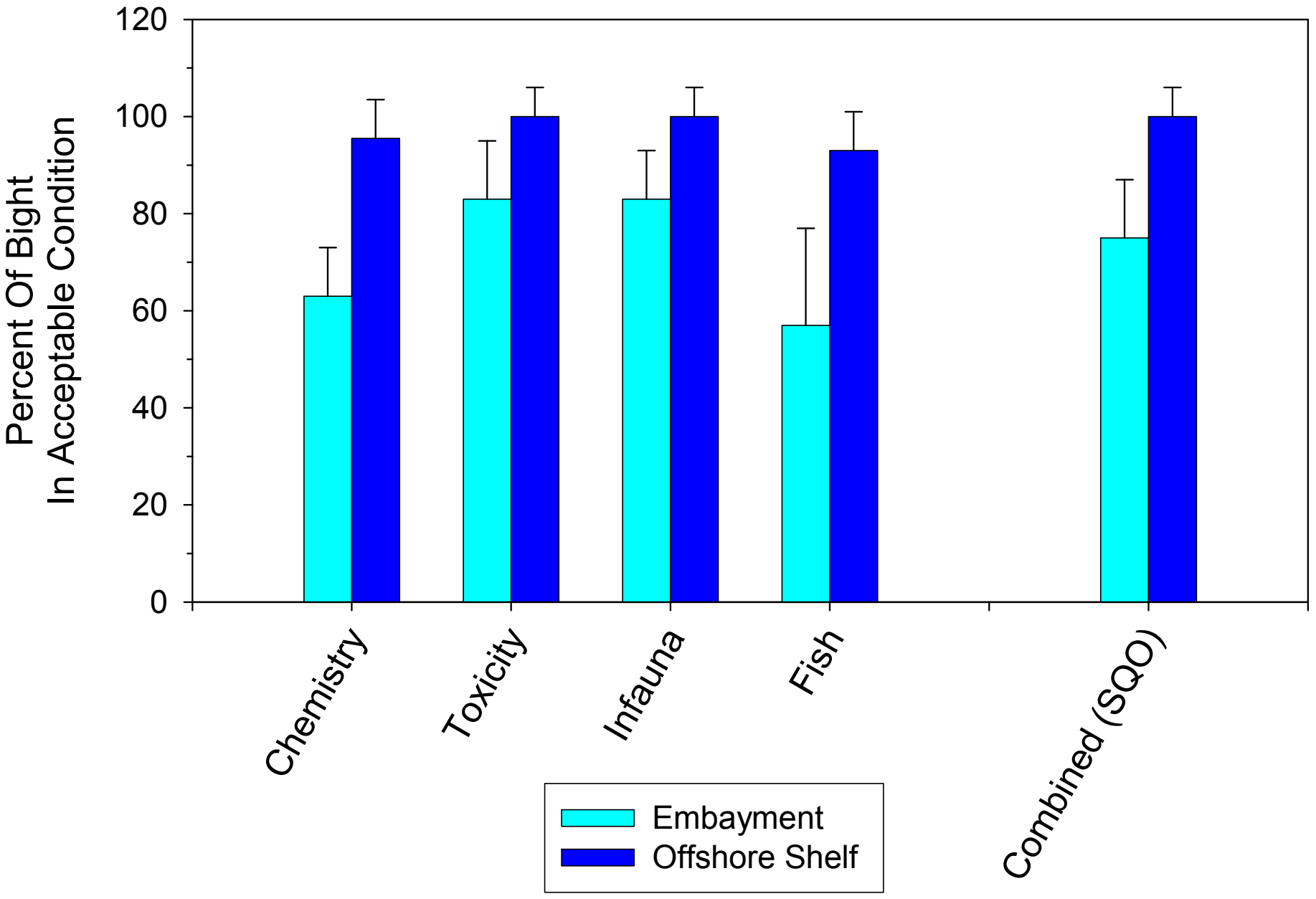
Bight Is a Unique Opportunity for Member Agency Self-Evaluation

- Collaborative program requires comparability
  - Sampling, chemistry, toxicity, biology
- Expend tremendous effort on training and intercalibrations
  - Third party evaluations are critical
- Our assessment is that member agencies have become proficient
  - Maintain proficiency over time

Laboratory Intercalibration for Total PCBs

Study	Concentration Range (ng/dry g)	Coefficient of Variation
Bight ‘98 – Before	529 – 1,950	46%
Bight ‘98 – After	901 – 1,500	20%
Bight ‘03 – Before	920 – 1,442	19%
Bight ‘08 - Before	727 – 1,058	16%

Bight '08 Results



Condition Change Over Last 10 Years (Combined Indicators)