

Longitudinal Indicators of Policy Impact: PCB Ban

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Overall Project Objectives and Approach

- Objectives
 - To develop and present state level environmental health outcome indicators that measure changes over time; and
 - To apply environmental health outcome indicators to evaluate the impact of environmental policies on population exposures and health risks.
- Approach: Application of risk assessment

Current context – NJ Advisories

NJDEP - Fish Advisories - Microsoft Internet Explorer provided by JHSPH Information Systems

http://www.state.nj.us/dep/dsr/fishadvisories/fish-i-fish.htm

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NJDEP - Fish Advisories Home Feeds (1) Read Mail Print Page Safety Tools Help >>






Coast

American Eel  General Population 4 meals / year High Risk Do Not Eat!	Bluefish less than 6lbs./24"  General Population 1 meal / month High Risk Do Not Eat!	American Lobster  General Population & High Risk Do Not Eat Green Gland (tomalley or hepatopancreas)
Bluefish greater than 6lbs./24"  General Population 6 meals / year High Risk Do Not Eat!	Striped Bass  General Population High Risk Do Not Eat!	

Inland

Largemouth Bass  General Population 1 meal / week High Risk 1 meal / month	Sunfish (includes bluegill, pumpkinseed and redbreast sunfish)  General Population No Restrictions High Risk 1 meal / month	Brown Bullhead  General Population No Restrictions High Risk 1 meal / week
Chain Pickerel  Smallmouth Bass 	Yellow Bullhead 	

Pinelands

Largemouth Bass  General Population 1 meal / month High Risk Do Not Eat!	Brown Bullhead  General Population 1 meal / week High Risk Do Not Eat!	Sunfish (includes bluegill, pumpkinseed and redbreast sunfish)  General Population 1 meal / week High Risk 1 meal / month
Chain Pickerel 	Yellow Bullhead 	

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Done

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<http://www.state.nj.us/dep/dsr/fishadvisories/fish-i-fish.htm>

Policy change: PCB Ban and Phase-out

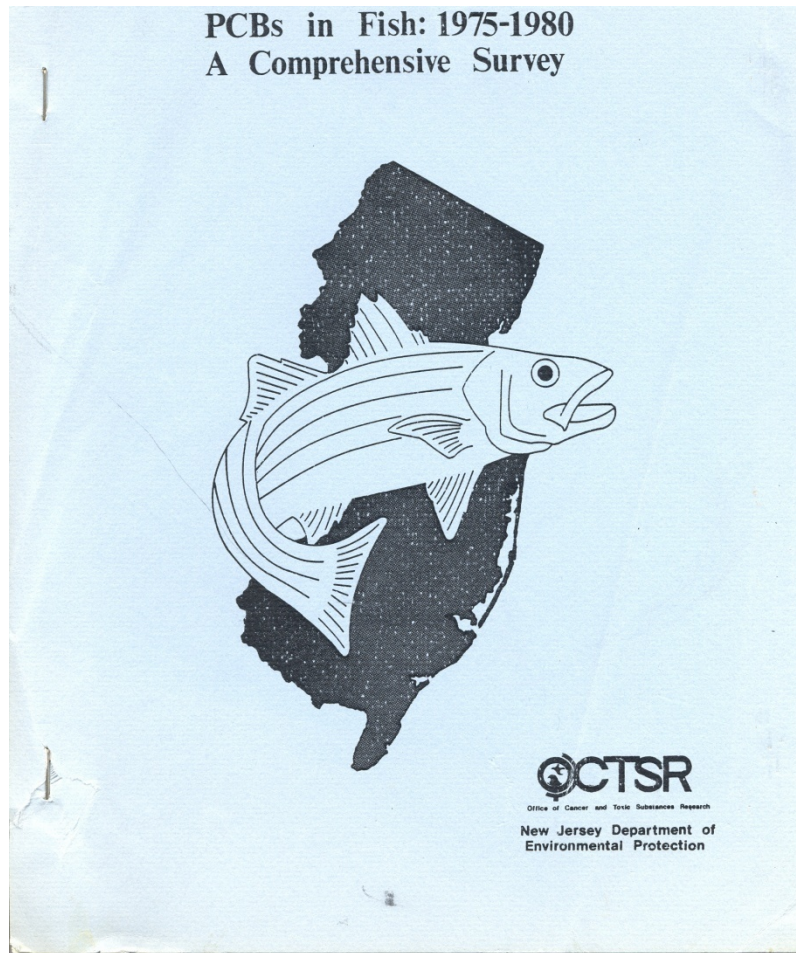


<http://www.epa.gov/history/topics/pcbs/01.html>

PESTICIDES FOUND IN SALT-WATER FISH

- **New York Times February 27, 1983**
- THE state's Department of Environmental Protection has determined that the same edible salt-water fish found to have potentially harmful levels of polychlorinated biphenyls also contain pesticides that could be dangerous to human health.

PCB Data Sources



- NJ fish tissue monitoring reports
 - Belton and Lockwood 1982 (shown at left)
 - Hauge et al. 1993 Results from New Jersey's Toxics in Biota Monitoring Program
 - Horwitz et al. 2008 Routine monitoring of toxics in New Jersey fish

Summary of PCB Sampling Results, Bass in New Jersey waters, ug/g wet weight

Analyte / Time Period / Number of Samples / Species	Median	Range
Arochlor 1254 / 1975-1980 / 54 / Striped Bass	1.58	0.12, 31.4
Total PCB / 1988-1989 / 55 / Striped Bass	1.24	0.48, 3.33
Total PCB / 2006 / 5 / Hybrid Striper	0.14	0.08, 0.27

Hybrid Striper



Photo source: <http://srac.msstate.edu/bass.htm>

Risk Assessment Approach

- Look at child and adult exposure to PCB through consumption of fish
 - Consumption on per capita basis and consumer-only
- Standard procedures to estimate average daily dose
- Characterize risk for non-cancer health effect
 - Hazard Quotient = Estimated dose / RfD

Risk Assessment Inputs

- Consumption and body weight data from EPA Exposure Factors Handbook (2009)
- Bioavailability of PCBs: Xing et al (2008) found 3% was accessible from fish
- $$\text{Dose} = \frac{\text{Concentration} * \text{Intake} * \text{Bioavailability}}{\text{Body Weight}}$$

Indicator of Policy Impact: HQ

Population	Arochlor 1254 Striped Bass, 1975-1980 Median (Min, Max)	Ban/ Phase out	Total PCB Striped Bass, 1988-1989 Median (Min, Max)	Total PCB Hybrid Striper, 2006 Median (Min, Max)
Adult Per Capita				
Central Tendency	1.4 (0.2, 4.4)		0.2 (0.1, 0.5)	0.02 (0.01, 0.04)
High (95 th ile)	9.1 (0.1, 29)		1.5 (0.5, 3.1)	0.1 (0.07, 0.2)
Child Per Capita				
Central Tendency	1.7 (0.2, 5.5)		0.3 (0.1, 0.6)	0.03 (0.01, 0.5)
High (95 th ile)	10 (0.1, 31)		1.6 (0.5, 3.2)	0.2 (0.08, 0.3)
Child Consumer Only				
Central Tendency	32 (0.4, 101)		5.2 (1.6, 11)	0.5 (0.3, 0.9)
High (95 th ile)	102 (1.4, 325)		17 (5, 34)	1.6 (0.8, 2.8)

Findings (1)

- Median PCB concentrations declined by an order of magnitude from late '70s to 2006
- Max PCB concentrations declined by two orders of magnitude from late '70s to 2006
- Child exposure scenarios yielded highest exposures and risks

Findings (2)

- Pre-ban all adult and child scenarios had $HQ > 1$ at the median
- Early post ban/phase out
 - $HQ > 1$ for adult and child percapita consumption at 95thile
 - $HQ > 1$ for the child consumer (at median and above)
- Recent sampling (2006)
 - Only child consumer at 95thile has $HQ > 1$

Indicator Conclusions

- This approach illustrates the success of the ban over the long term
- Documents the continuing need for exposure reduction policies for potentially vulnerable populations

EPHI for Policy Evaluation

- Valuable tool
- Can do a lot with a little (could do more with more?)
 - Data planning
 - Maintain monitoring programs
 - Other kinds of data (biomonitoring, health outcome surveillance?)
 - Methods that make clear link to policy

Thank you!

