

Human Health Criteria — Fish Consumption Rates



FISH CONSUMPTION SURVEY RESULTS

JULY 8, 2015

On the Agenda...

2

- Welcome and Introductions
- EPA's New HHC Released
- Summary of Comments on Policy Recommendations
 - Reconsideration of Steelhead Trout
 - More on use of PRA
 - Adjustment of RSC
- Update on Tribal Survey
- Idaho Fish Consumption Survey Update & Results
- Discussion
- What's Next / Revised Schedule

EPA 2015 Final HHC Recommendations

3

- Released on June 29, 2015
- Substantial changes in BAF, RSC and toxicity values

<http://water.epa.gov/scitech/swguidance/standards/criteria/current/hhfinal.cfm>

Disapproved, but no EPA Update

Copper (1)

Selenium

Thallium

Dioxin

N-Nitrosodimethylamine

N-Nitrosodi-n-Propylamine

N-Nitrosodiphenylamine

EPA Update, but not disapproved

1,1,1-Trichloroethane

3-Methyl-4-Chlorophenol

Bis(Chloromethyl)Ether

2,4-D

2,4,5-TP

Dinitrophenols

Hexachlorocyclohexane

Methoxychlor

Pentachlorobenzene

1,2,4,5-Tetrachlorobenzene

2,4,5-Trichlorophenol

Summary of Comments

4

Don A. Essig, DEQ



Commenters

5

- Comments received from following 10 parties:
 - Clearwater paper (CP)
 - Columbia River Inter-Tribal Fish Commission (CRITFC)
 - Idahoans for Sensible Water Regulation (ISWR)
 - Idaho Association of Commerce and Industry & ARCADIS (IACI/ARCADIS)
 - Idaho Power Company (IPC)
 - Idaho Conservation League (ICL)
 - Confederated Tribes of the Umatilla Indian Reservation (CTUIR)
 - Upper Snake River Tribes Foundation (USRT)
 - Nez Perce Tribe (NPT)
 - USEPA Region 10 (EPA)

Fish Consumers Only

6

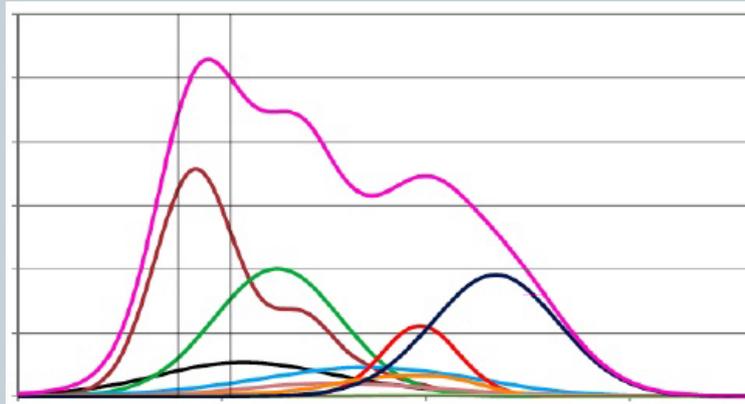
- We recommended basing Idaho's fish consumption rate on consumers only. A fish consumer being anyone who reported eating fish in the 12 months preceding inquiry.
 - In favor: IACI, ICL, USRT, EPA
 - Opposed: none
 - No opinion, or unclear: CP, CRITFC, ISWR, IPC, CTUIR, NPT



Target Population

7

- Follow EPA guidance and compare risks in the general population and higher risk populations
 - In favor: **IACI, EPA**
 - Opposed: none
 - No opinion, or unclear: **CP, CRITFC, ISWR, IPC, ICL, CTUIR, NPT**



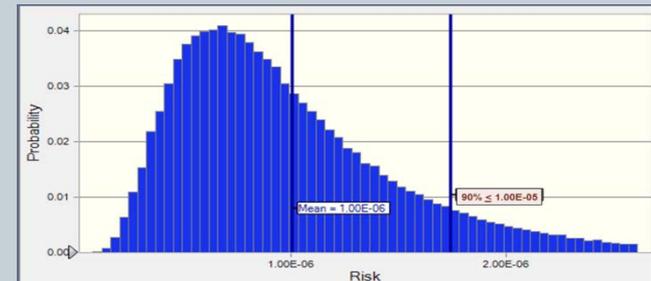
Criteria Calculation

8

- We recommended calculating criteria using both the traditional deterministic way and using probabilistic risk assessment techniques.
 - In favor: CP, ISWR, IACI, ICL
 - Opposed: CTUIR, NPT
 - No opinion, or unclear: CRITFC, IPC, USRT, EPA

Noncancer Effects

$$AWQC = RfD \cdot RSC \cdot \left(\frac{BW}{DI + \sum_{i=2}^4 (FI_i \cdot BAF_i)} \right)$$



Market Fish

9

- We recommended the exclusion of fish purchased in the market from incorporation in fish consumption rates, with the exception of rainbow trout because they may have been raised in Idaho waters.
 - In favor: CP, ISWR, IACI, IPC
 - Opposed: ICL, USRT, NPT, EPA
 - No opinion, or unclear: CRITFC, CTUIR



Seagoing Fish

10

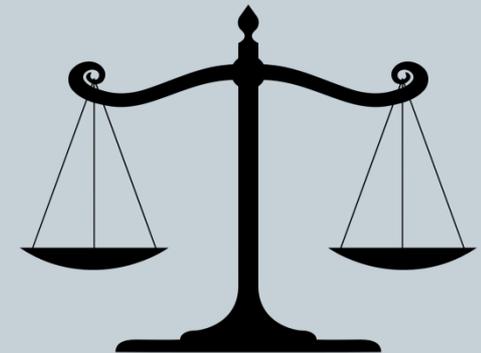
- We recommended the exclusion of anadromous salmon from incorporation in fish consumption rates used to formulate criteria.
 - In favor: CP, ISWR, IACI, IPC
 - Opposed: CRITFC, ICL, CTUIR, USRT, NPT, EPA
 - No opinion, or unclear:



Risk Management

11

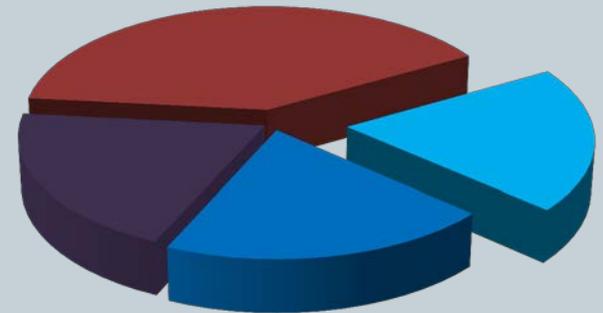
- We recommended using an incremental cancer risk level of 10^{-6} for carcinogens and a hazard quotient of 1 for non-carcinogens. Applied to both the general population and higher consuming populations, at 95th %tile and mean respectively.
 - In favor: CRITFC, ICL, CTUIR, USRT, EPA
 - Opposed: NPT
 - No opinion, or unclear: CP, ISWR, IACI, IPC



Relative Source Contribution

12

- We recommended use of a relative source contribution, but with adjustment from EPA's default minimum of 0.2 to account for changes in fish consumption, drinking water intake, and bioaccumulation factor.



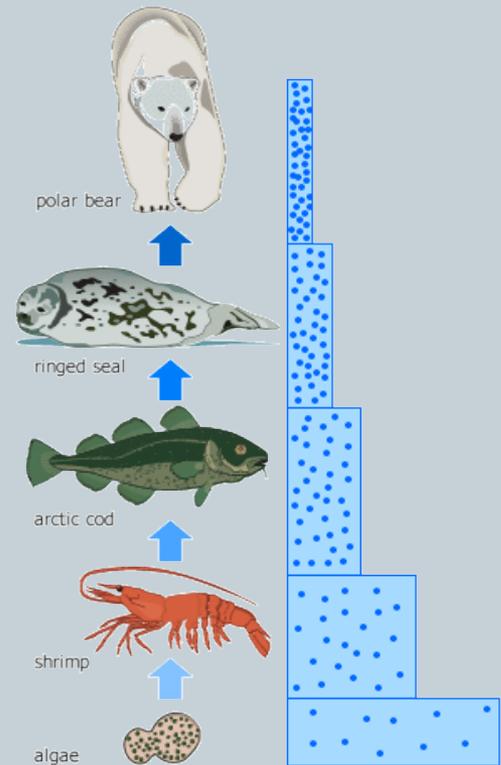
- In favor: CP, IACI
- Opposed: ICL, CTUIR, USRT, NPT, EPA
- No opinion, or unclear: ISWR, CRITFC, IPC

BAF or BCF

13

- We recommended using BAF rather than BCF. We will rely on EPA published values unless presented with better information.

- In favor: CP, IACI, ICL USRT, EPA
- Opposed:
- No opinion, or unclear: CRITFC, ISWR
IPC, CTUIR, NPT



Body Weight and Drinking Water Intake

14

- We recommended using a mean adult body weight, and are using our own survey data.
- We also recommended using drinking water intake of 2.4 L/day.
 - In favor: CP, IACI, EPA
 - Opposed: ICL, CTUIR, USRT
 - No opinion, or unclear: CRITFC, ISWR, IPC, NPT

No Backsliding

15

- We recommended that if new criteria were calculated to be less stringent than now, we would stick with current criteria.
 - In favor: ICL, CTUIR, USRT
 - Opposed: CP, IACI
 - No opinion, or unclear: CRITFC, ISWR, IPC, NPT, EPA



Other Matters

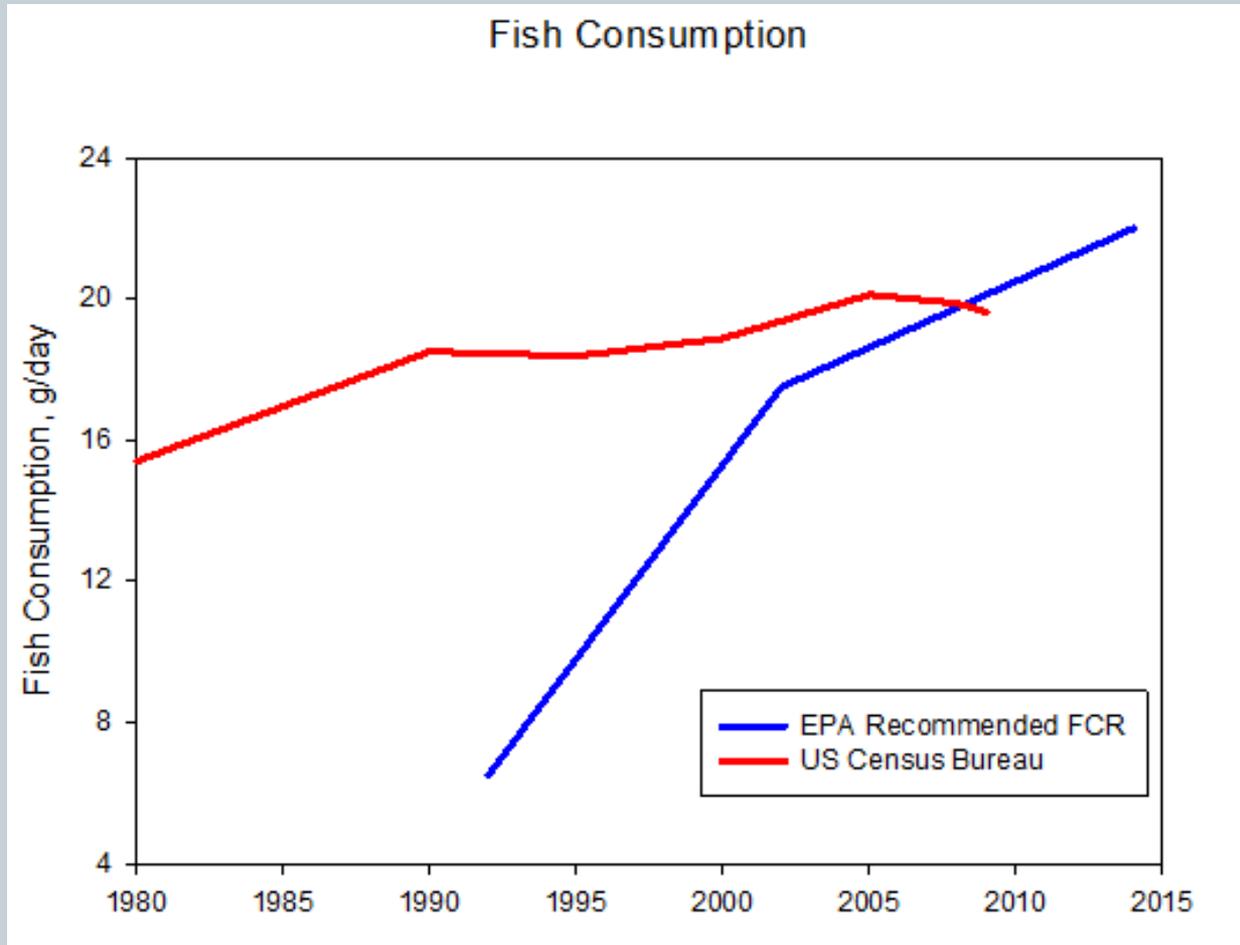
16

- Toxicity values
- Downstream waters protection
- Suppression of consumption
- Tribal treaty rights



Downward or Upward Spiral?

17



Fish Groups

18

DON A. ESSIG, DEQ

Idaho Fish

19

- Includes freshwater species, but not marine or estuarine
- Includes steelhead trout, but not Chinook or Coho salmon
- Includes rainbow trout, regardless of if purchased or not

Included Species	Excluded Species
All trout + whitefish, perch, walleye, catfish, bass, bluegill, crappie, northern pike, sturgeon, crayfish, kokanee and steelhead ... <i>- if caught in Idaho waters -</i>	Tuna, pollock, tilapia, halibut, swordfish, cod, shrimp, crab, clams, oysters, scallops, lobster, Chinook and Coho salmon, <i>sushi, fish 'n' chips, fish sticks</i>

Top 10 List of Seafood Consumption

20

Proportion of Total Seafood Consumed on a Given Day, for Various Types of Seafood, 1999–2000

Rank	Seafood Type	Percent Consumed	Cumulative Percent
1	Tuna	22.1	22.1
2	Shrimp	16.1	38.2
3	Salmon	8.9	47.1
4	Mix of fish	8.1	55.2
5	Crab	7.5	62.7
6	Cod	5.1	67.8
7	Flounder	4.5	72.3
8	Catfish	4.2	76.5
9	Don't know type	3.4	79.9
10	Clams	2.4	82.3

SOURCE: DGAC, 2005

<http://www.nap.edu/catalog/11762.html>

More on PRA

21

DON A. ESSIG, DEQ

Distributions & Point Estimates

22

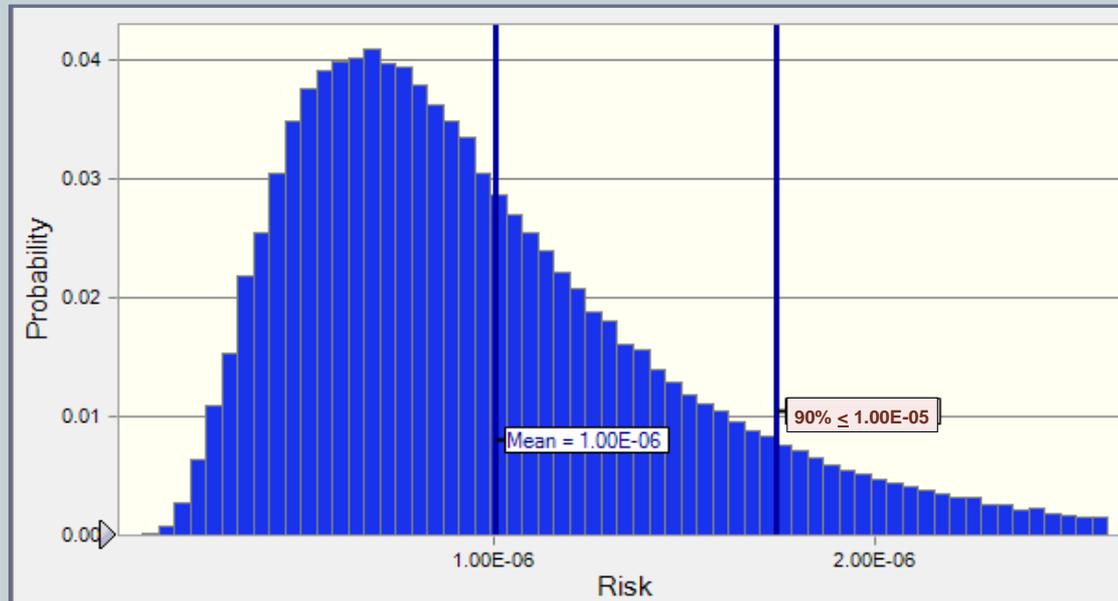
- Distributions will be used for:
 - Body weight (BW), Idaho survey data, mean 80 Kg
 - Drinking Water Intake (DI), Exposure Factors Handbook
 - Fish Consumption Rate (FI), Idaho survey data
- Point estimates for other inputs (RfD or CSF, BAF); same values as for deterministic calculations

$$AWQC = RfD \times RSC \times \left(\frac{BW}{DI + \sum_{i=2}^4 (FI_i \times BAF_i)} \right)$$

PRA Endpoints

23

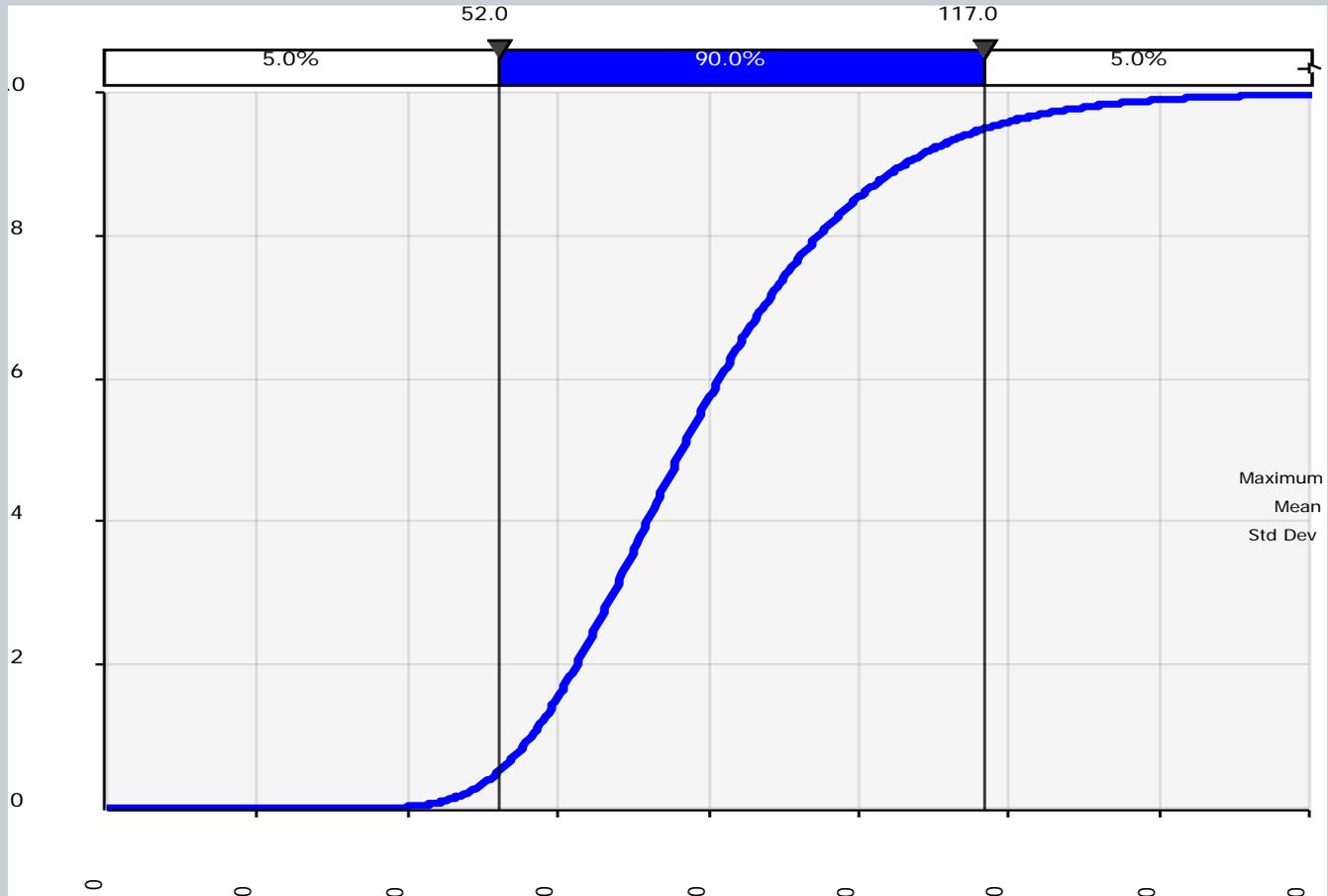
- Same incremental cancer risk level and hazard quotient as used in deterministic criteria calculations
- Difference is that output is distribution of risk for a particular water concentration:



Input Distribution - BW

24

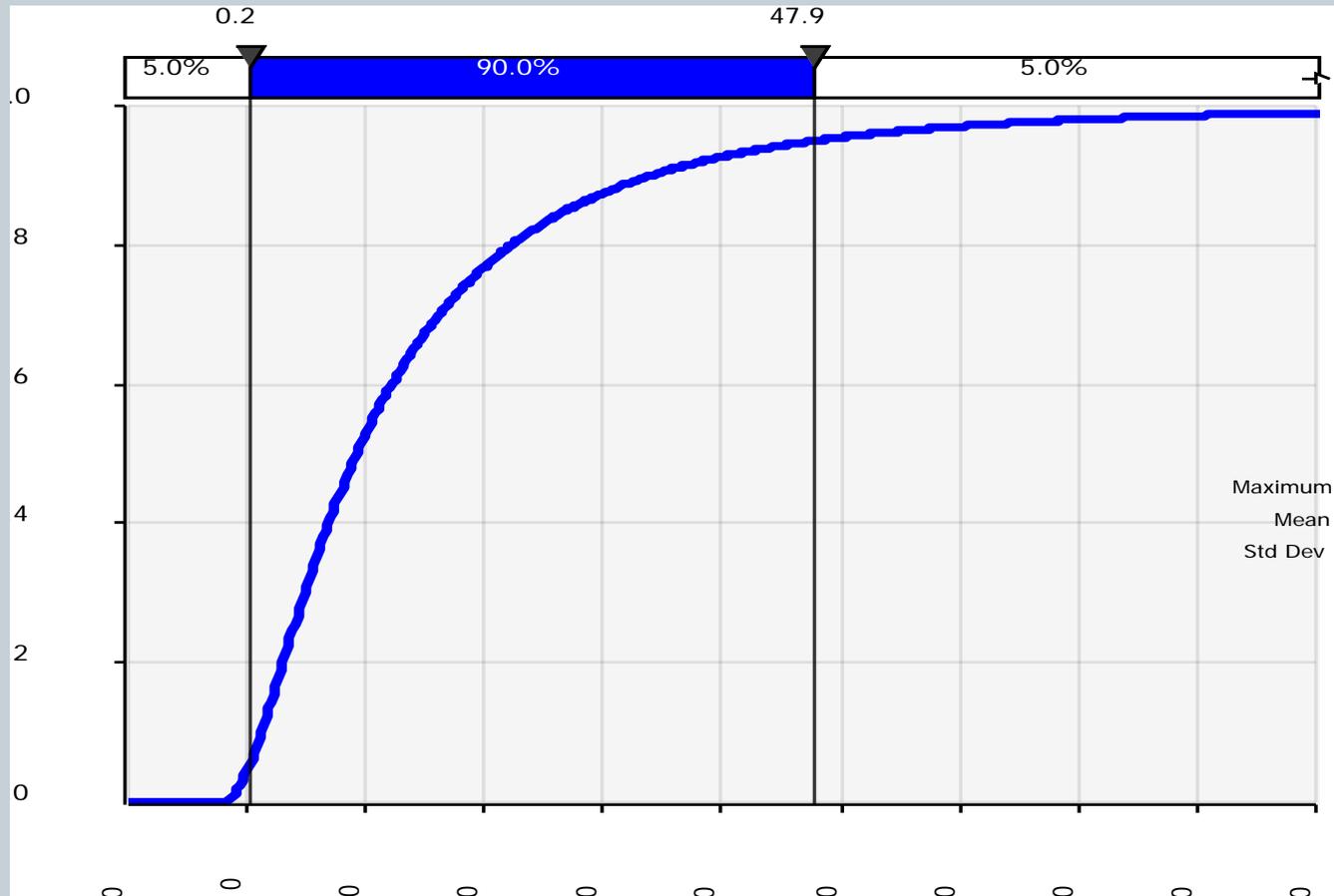
Body weight distribution (kg)



Input Distribution - DI

25

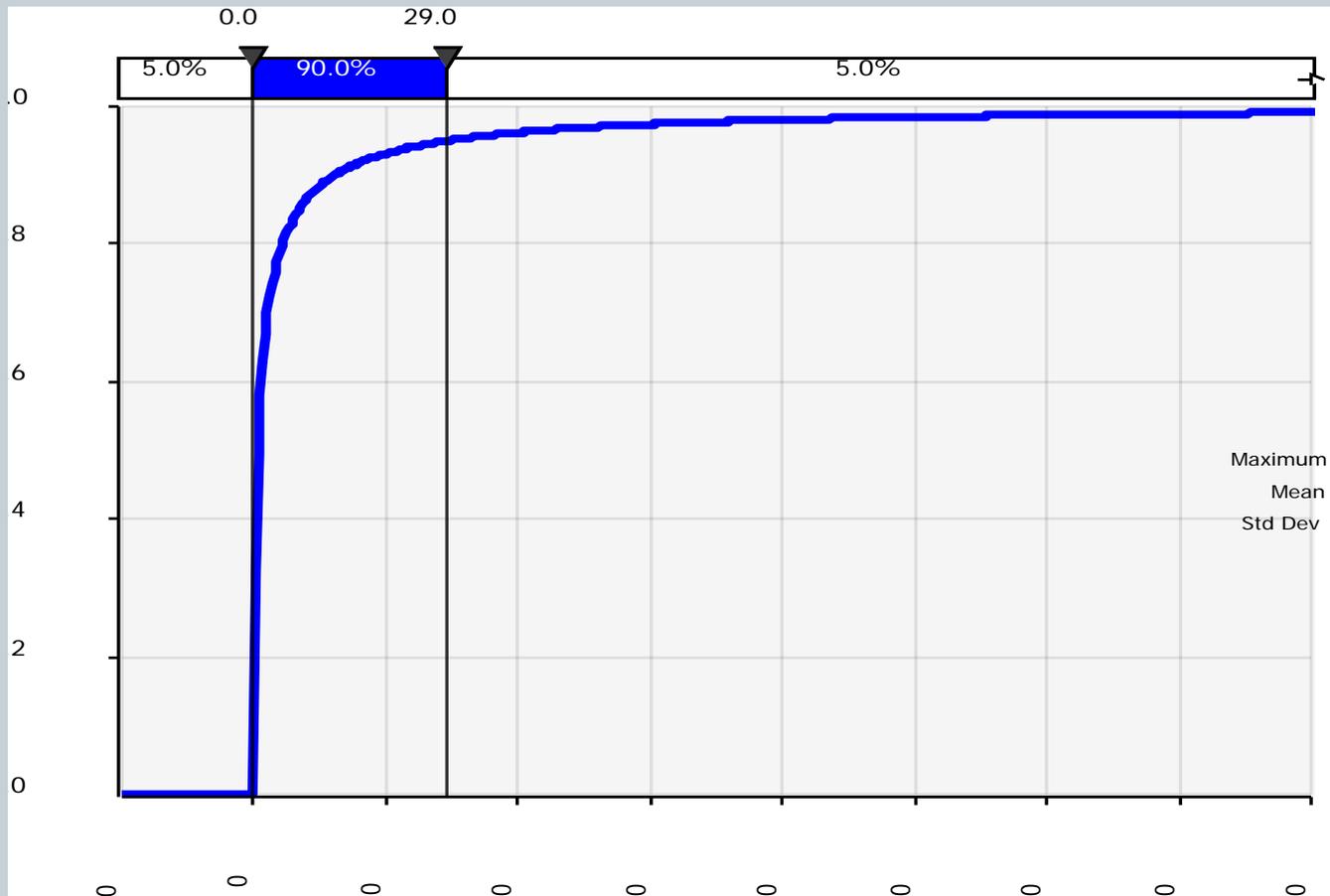
Drinking water ingestion rate distribution (body-weight normalized, mL/day-kg)



Input Distribution – FI Total

26

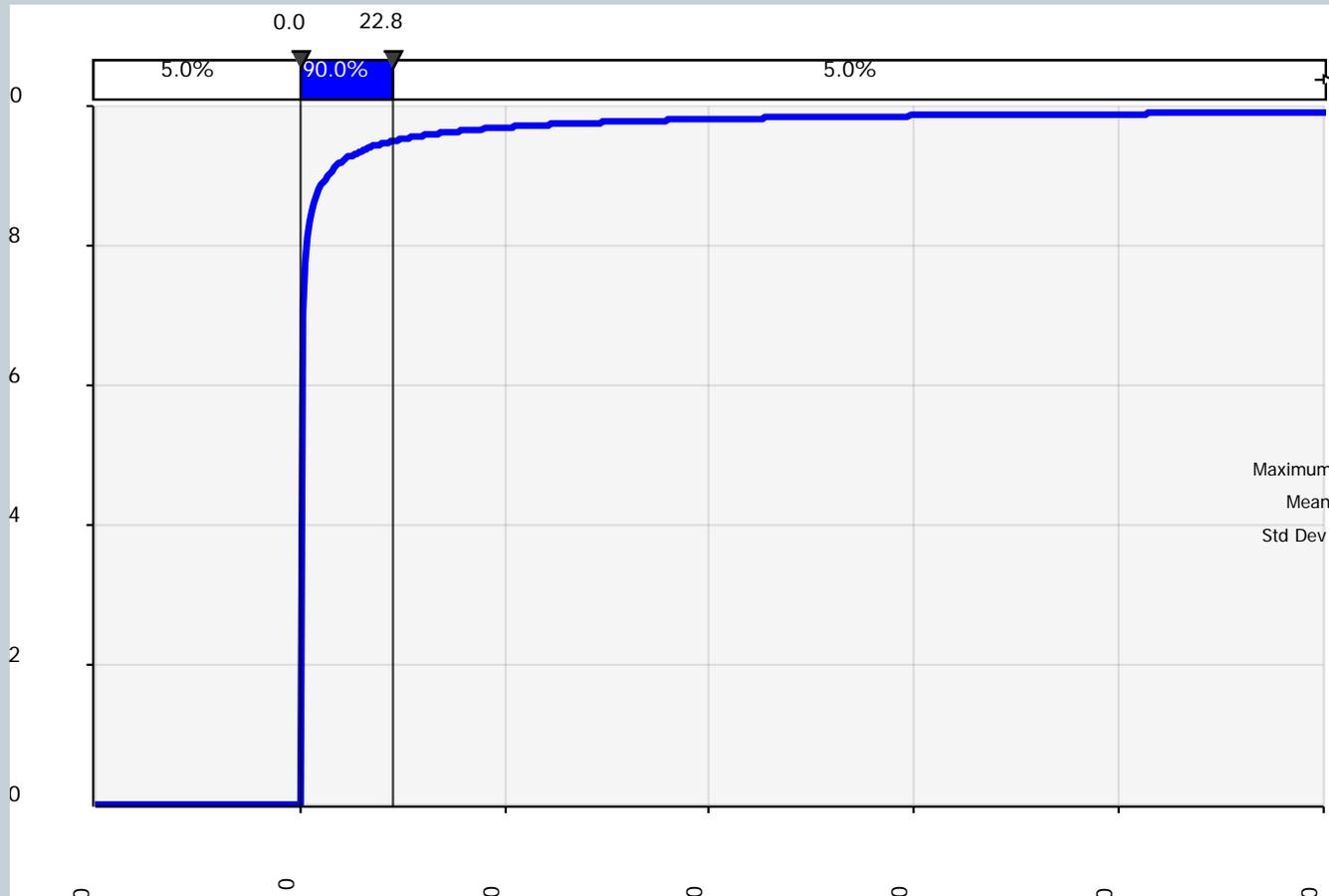
Fish consumption rate distribution (total population), g/day



Input Distribution – FI Angler

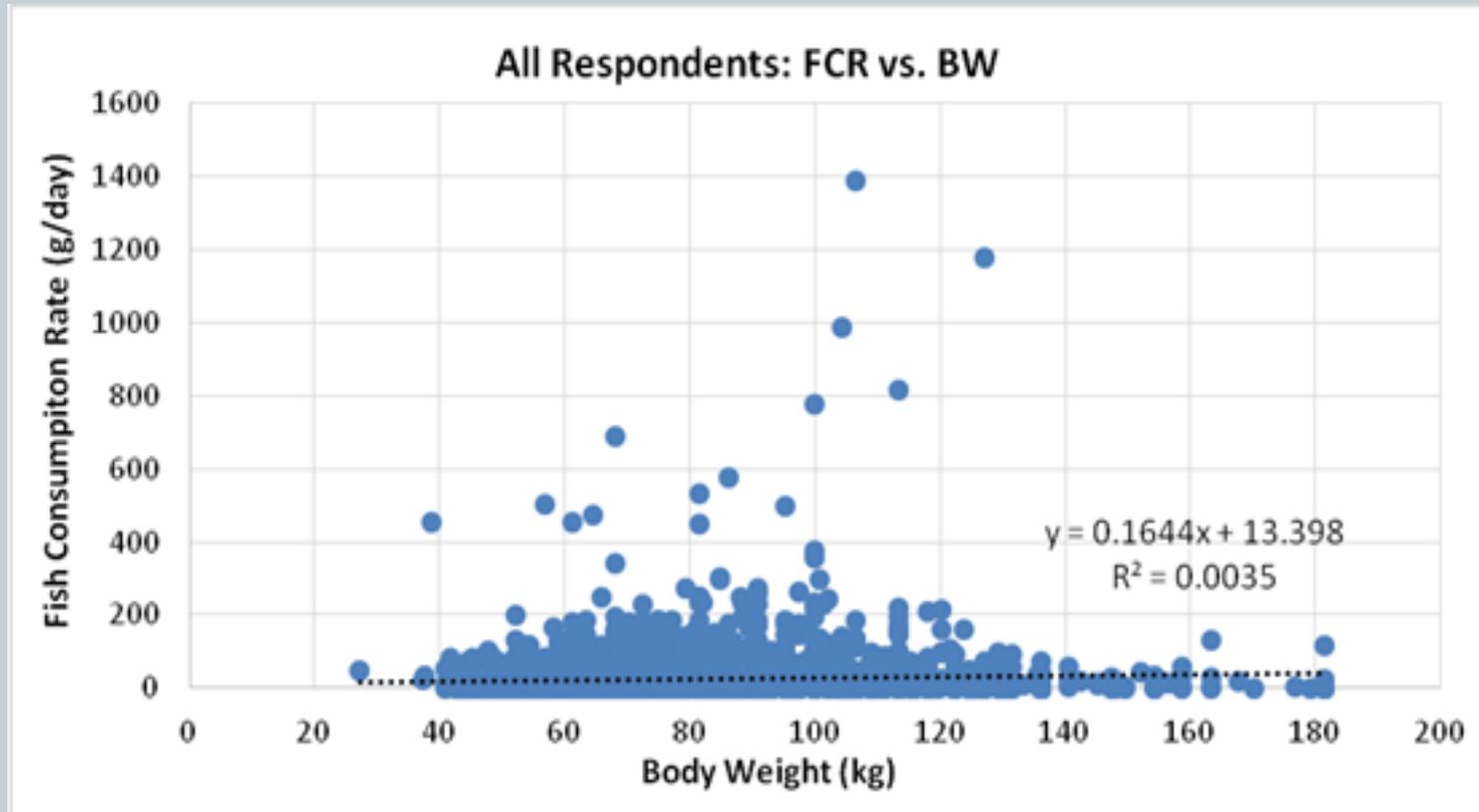
27

Fish consumption rate distribution (total population), g/day



No Correlation BW vs FI

28



Integrating PRA & Deterministic Calcs

29

- We will report results of both for comparison
- We will use PRA results for Idaho criteria

More on RSC

30

DON A. ESSIG, DEQ

RSC and FCR

31

- EPA makes it clear RSC is linked to FCR:
 - “Therefore, to protect humans who additionally consume marine species of fish, the marine portion should be considered an *other source of exposure* when calculating an RSC for dietary intake. Refer to the Exposure Assessment TSD for further discussion. States and Tribes need to ensure that when evaluating overall exposure to a contaminant, marine fish intake is not double-counted with the other dietary intake estimate used.” (*EPA 2000 HHC Methodology*)
 - “Exposures outside of the RSC include, but are not limited to, exposure to a particular pollutant from ocean fish consumption (not included in the fish consumption rate), non-fish food consumption (meats, poultry, fruits, vegetables, and grains), dermal exposure, and respiratory exposure.” (*EPA 2015 HHC Factsheet*)

Increase in Exposure

32

- EPA's 2015 default FCR is 22 g/day, up from 17.5 g/day, and DI is now 2.4 L/day, up from 2.0 L/day.
- These are an increase in exposure of 26% and 20% respectively.
- Relative exposure for Fish only and Fish + Water exposures are BAF dependent:

BAF	Fish	Water	Fish/Fish + Water Ratio
1	22	2400	0.009
100	2200	2400	0.48
1,000	22,000	2400	0.90

A Rock and a Hard Place

33

- “EPA recommends that DEQ include market fish in the FCR used to derive human health criteria.”
- “While EPA's 304(a) recommended criteria account for exposures to non-carcinogens and nonlinear carcinogens in anadromous fish using the RSC, EPA supports and recommends that states include anadromous fish in the FCR when there are available, scientifically sound regional and/or local data that suggest high consumption of anadromous fish.”
- “DEQ would need to provide chemical-specific alternate route exposure to modify the RSC in a data driven way that is scientifically sound.”

Source: EPA May 29, 2015 comment letter

EPA's Decision Tree – Step 4

34

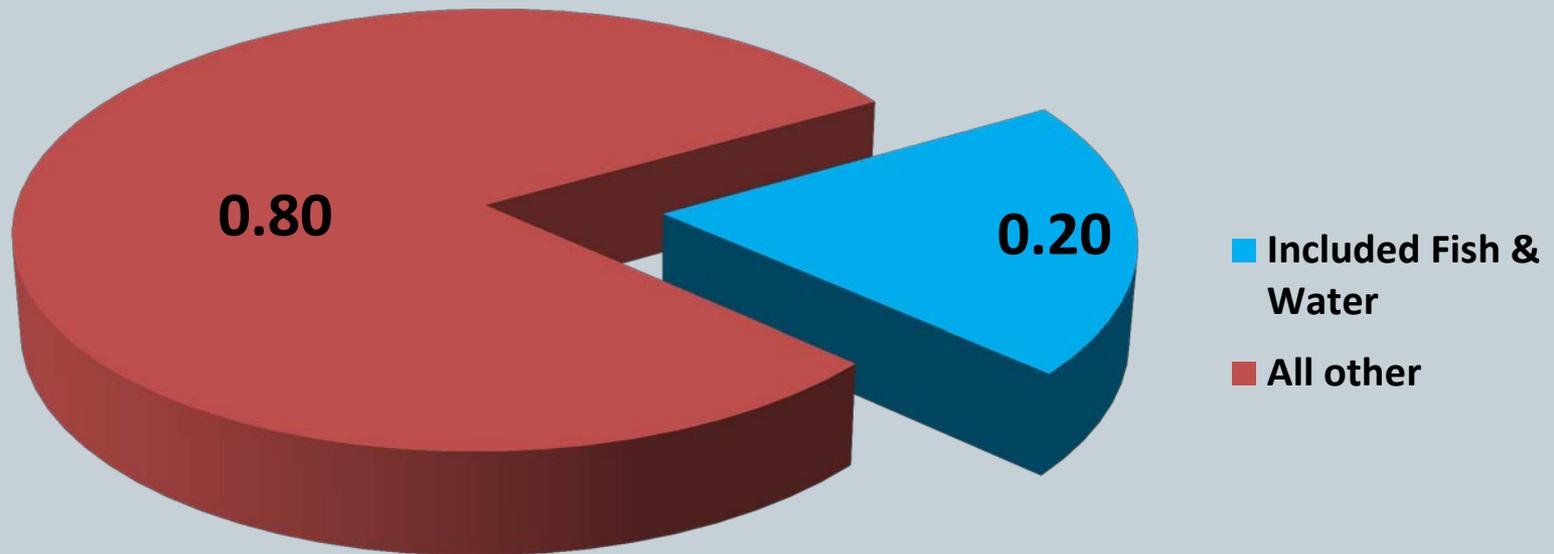
“Are there sufficient data, physical/chemical property information, fate and transport information, and/or generalized information available to characterize the likelihood of exposure to relevant sources?”

Our answer is yes – on ‘generalized information’, sufficient to characterize how changing ingestion rates and BAF affect relative exposure.

EPA's 2000 Default RSC

35

Relative Source - Included Fish & Water vs Other



Simplifying Assumptions

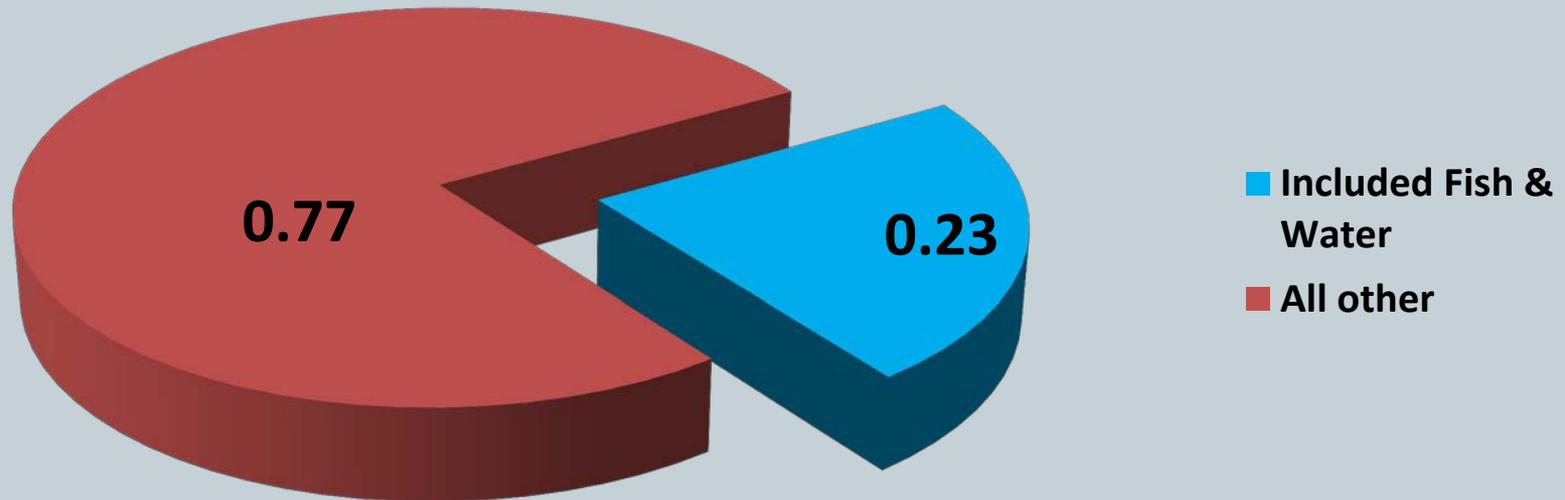
36

- Quality of fish and water consumed is not altered by choosing a higher regulatory FCR or DI.
- Increased 'water exposure' does not change other exposures

RSC Adjusted for Increase in FI & DI

37

Relative Source - Included Fish & Water vs Other



BCF = 1

Table of Idaho's RSC Adjustment

Table 1. RSC adjusted from EPA 2002 base by FCR and BAF

FCR \ BAF	6.5 g/day	17.5 g/day	22 g/day	44 g/day	88 g/day	110 g/day	175 g/day
1	0.23	0.23	0.23	0.23	0.24	0.24	0.24
10	0.23	0.24	0.25	0.26	0.29	0.30	0.34
100	0.27	0.34	0.36	0.46	0.58	0.62	0.71
1000	0.52	0.71	0.75	0.85	0.92	0.93	0.96
10000	0.89	0.96	0.96	0.98	0.99	0.99	1.00

Example Calculation - Chlorobenzene

39

BAF = 25, DI = 2.4 L/day, FI = 22 g/day

$$\text{Adj RSC} = (22 \times 25) + (2.4 \times 1000) / [(4 \times 2017.5) + ((22 \times 25) + (2.4 \times 1000))] = \mathbf{0.27}$$

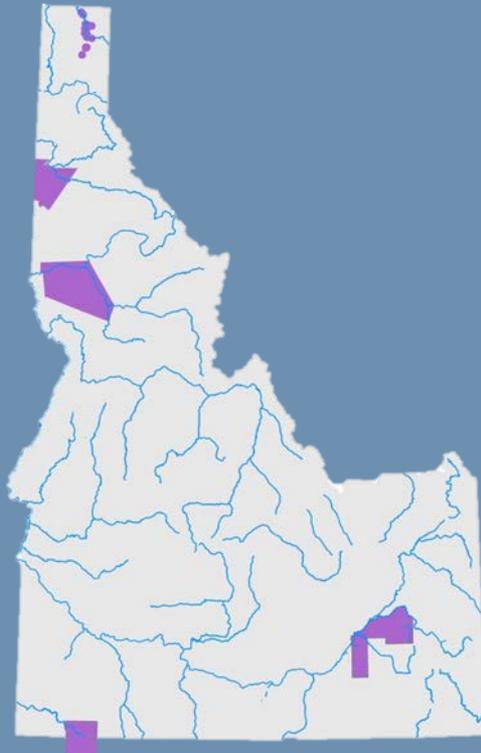
22 x 25 = new FI contribution

2.4 x 1000 = new DI contribution

2017.5 = old FI + DI contribution, 4 times that is the 80%
not allocated to CWA criteria

Tribal Survey Update

40



Mary Lou Soscia, EPA



Idaho Fish Consumption Survey Results

41

**Rebecca Elmore-Yalch NWRG
and Don A. Essig, DEQ**



Idaho Fish Consumption Survey

Fish Survey Results Comparison

43

- Going to show you 3 tables
 - 1) FFQ results, all fish – comparing 4 surveys
 - 2) Dietary Recall results, all fish – 4 surveys
 - 3) Dietary Recall results, select fish groups – 4 surveys
- And 4 graphs

FFQ Survey Results

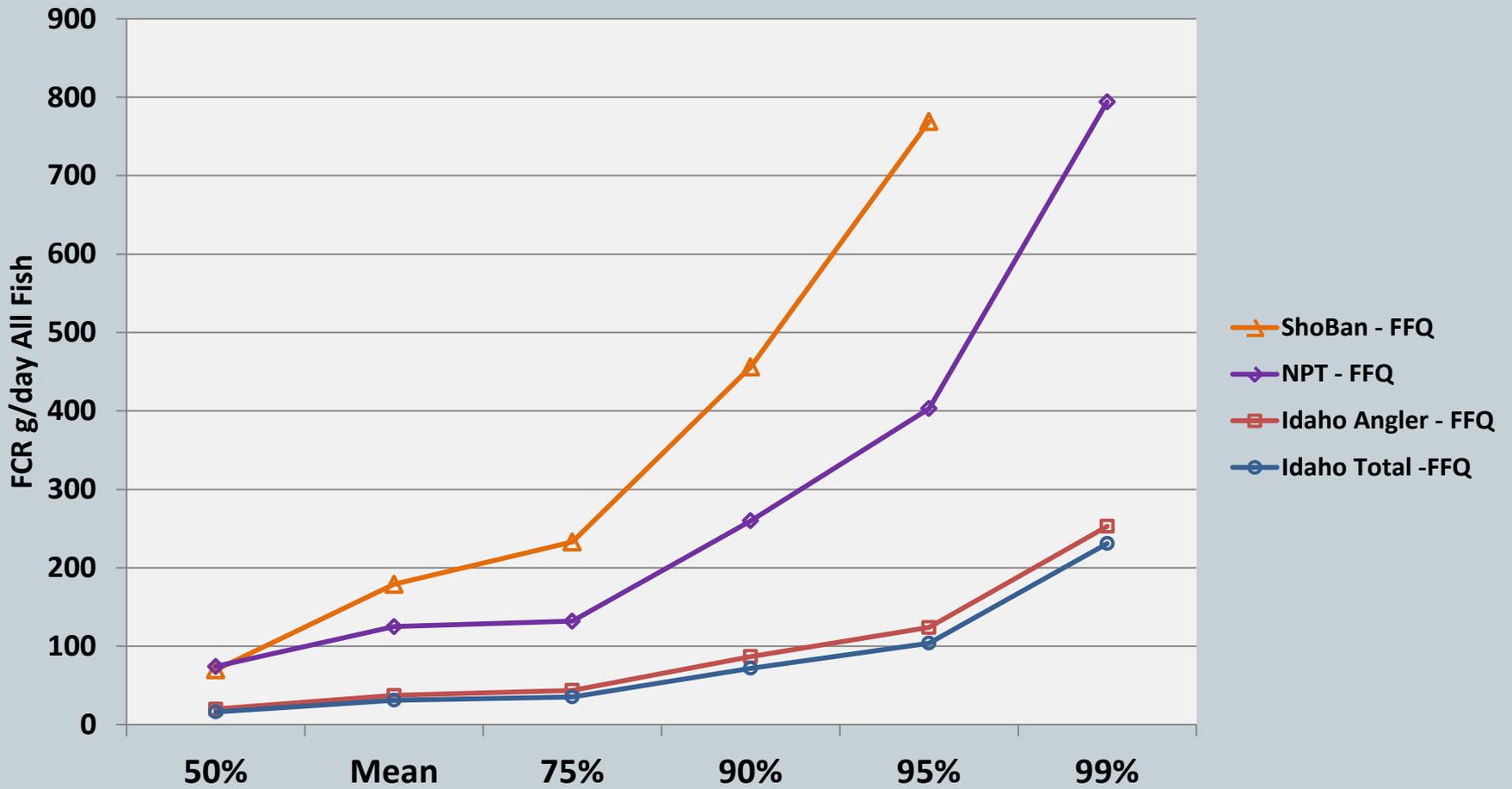
44

All Fish

Survey/Population	50%	Mean	75%	90%	95%	99%
Idaho Total	16.2	31.3	35.4	71.9	104	231
Idaho Angler	19.9	37.3	43.8	87.0	124	253
Nez Perce	74.2	125	132	260	403	794
Shoshone Bannock	69.8	179	233	456	769	---

Four Populations - FFQ

45



Dietary Recall Results

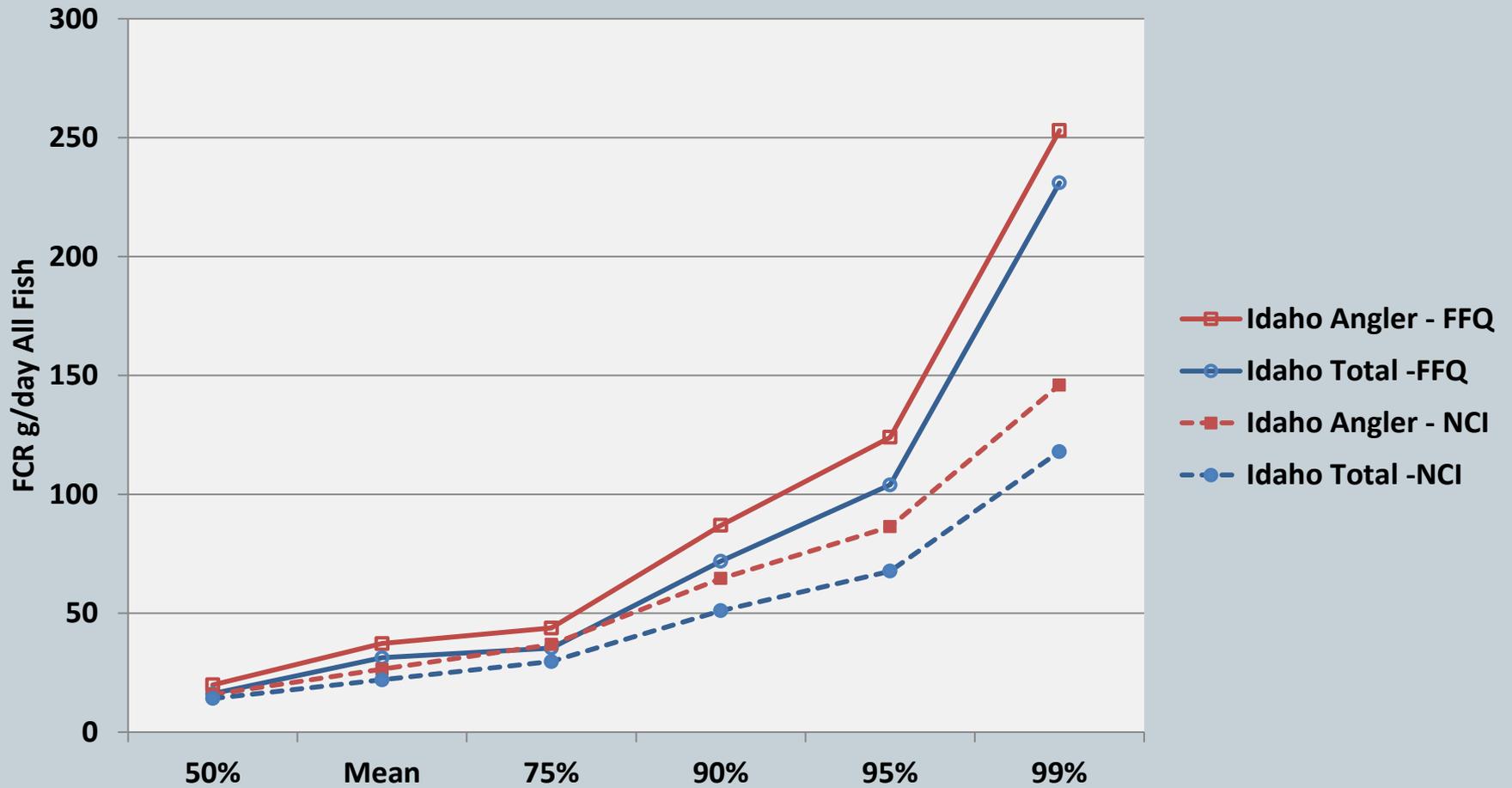
46

All Fish

Survey/Population	50%	Mean	75%	90%	95%	99%
Idaho Total	14.2	22.0	29.7	51.1	67.7	118
Idaho Angler	15.9	26.5	36.9	64.6	86.4	146
Nez Perce						
Shoshone Bannock						
EPA 2002 – no NCI	0	19.9	---	74.8	111	216
EPA 2014 - NCI	17.6	---	32.8	52.8	68.1	105

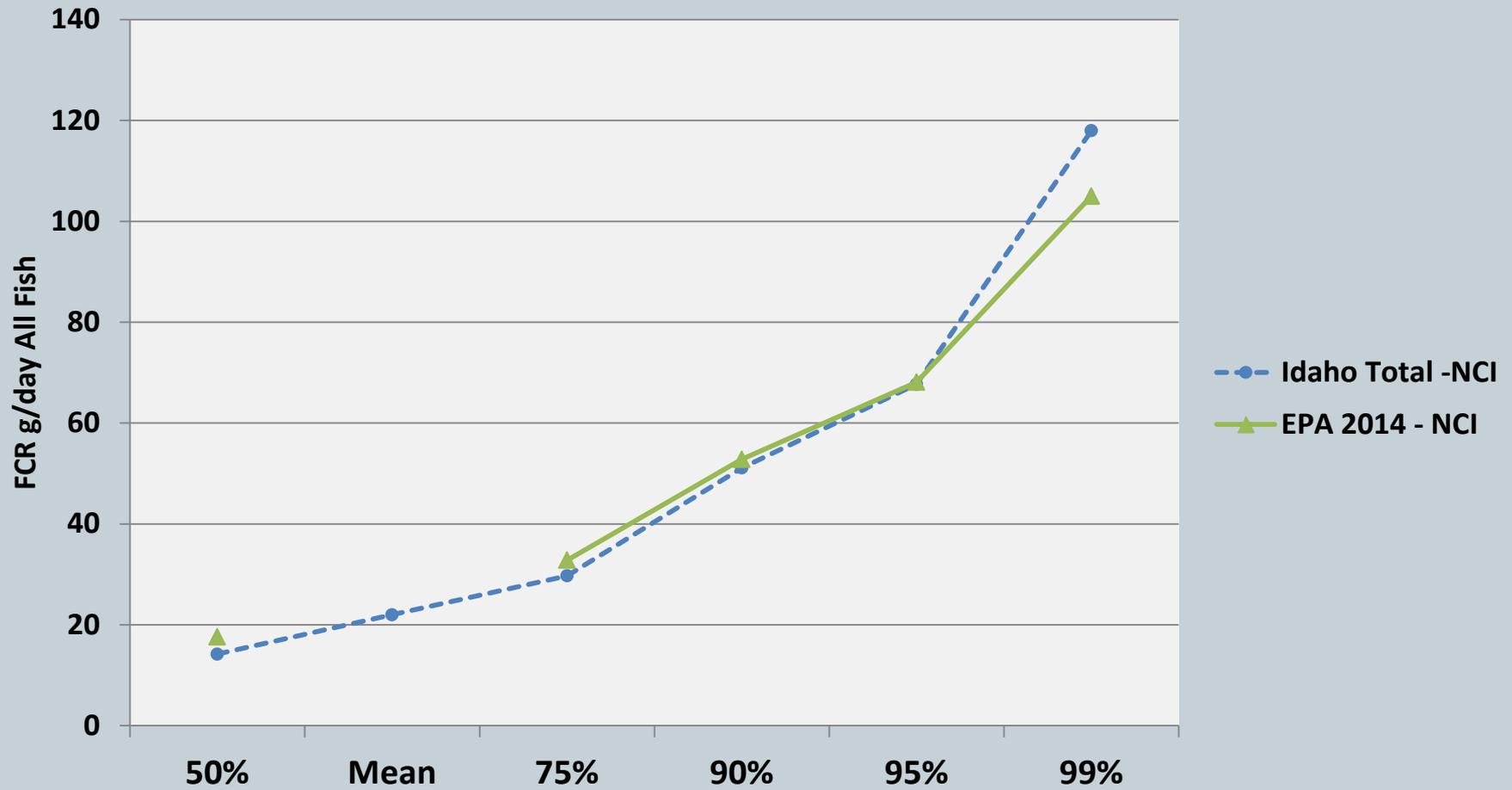
FFQ vs DR + NCI

47



Idaho All Fish vs EPA All Fish

48



Dietary Recall Results

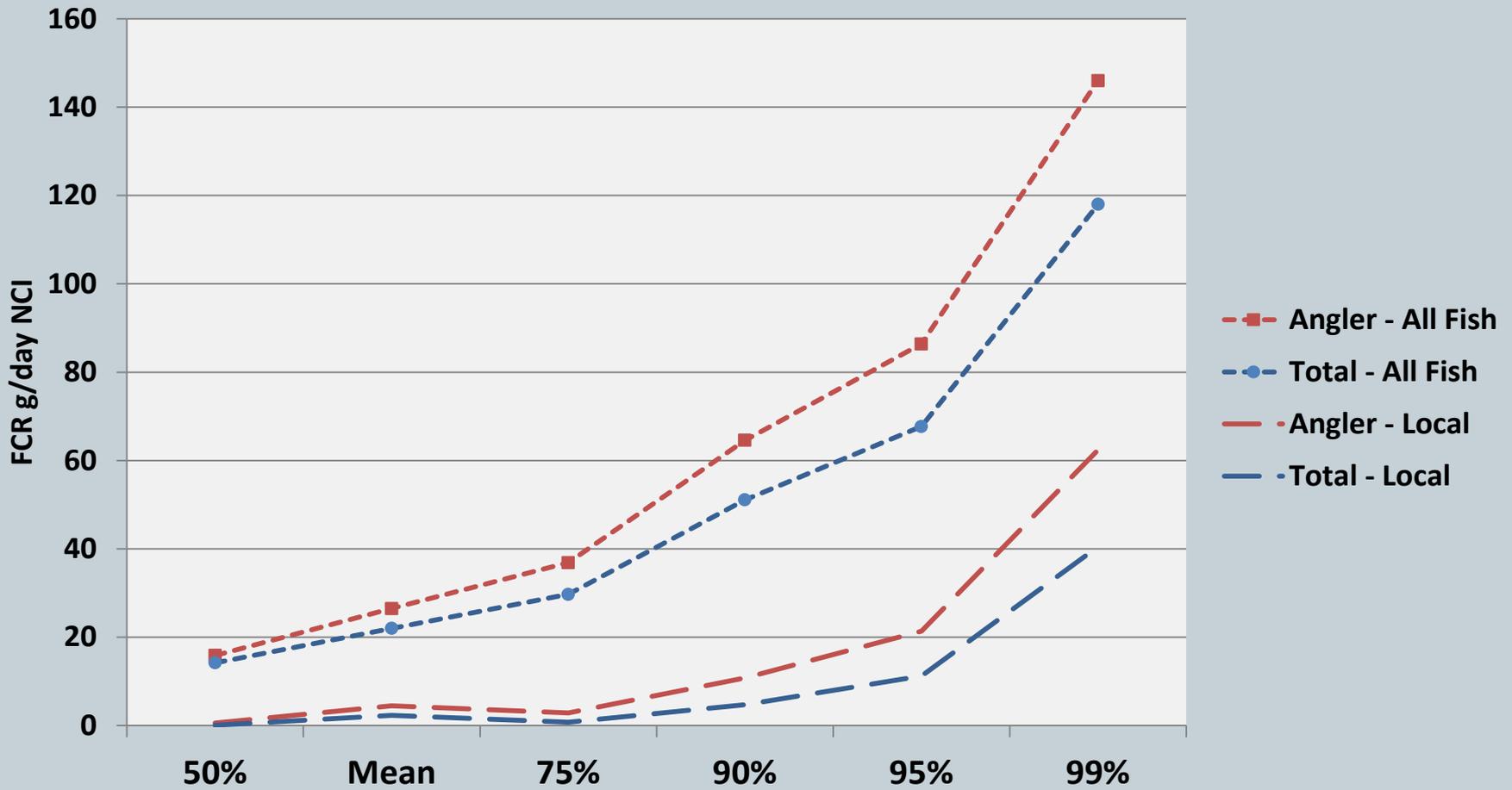
49

Idaho/Group 2/non-Marine Fish

Survey/Population	50%	Mean	75%	90%	95%	99%
Idaho Total	0.1	2.3	0.8	4.7	11.2	40.5
Idaho Angler	0.6	4.5	2.9	10.8	21.4	62.4
Nez Perce						
Shoshone Bannock						
EPA 2002 – no NCI	0	7.5	---	17.4	49.6	143
EPA 2014 - NCI	5.0	---	11.4	22.0	31.8	61.1

Idaho All Fish vs Local Fish

50



Freshwater Fish Consumption?

51

Proportion of Total Seafood Consumed on a Given Day, for Various Types of Seafood, 1999–2000

Rank	Seafood Type	Percent Consumed	Cumulative Percent	Marine/Estuarine/Freshwater		
1	Tuna	22.1	22.1	100	/ 0	/ 0
2	Shrimp	16.1	38.2	17.6	/ 82.4	/ 0
3	Salmon	8.9	47.1	96	/ 3.5	/ 0.5
4	Mix of fish	8.1	55.2	52	/ 32	/ 16
5	Crab	7.5	62.7	27.3	/ 72.7	/ 0
6	Cod	5.1	67.8	100	/ 0	/ 0
7	Flounder ^a	4.5	72.3	87	/ 13	/ 0
8	Catfish	4.2	76.5	0	/ 10	/ 90
9	Don't know type	3.4	79.9			
10	Clams	2.4	82.3	84	/ 16	/ 0

SOURCE: DGAC, 2005

EPA, 2014

^aEPA Reports breakdown by habitat for flatfish, not specifically flounder

Discussion

52



Next Steps

53

- Final rulemaking meeting Aug 6th, prelim-draft rule
- Proposed rule goes to Dept. of Admin. Sept. 11th
- Proposed Rule published in Admin. Bulletin Oct, 7th
 - Starts 30-day public comment period
- Nov. 6th to 20th, DEQ prepares response to comments
- Dec. ? - SPECIAL Meeting of DEQ Board
- Jan 6th, 2016 Pending Rule Published

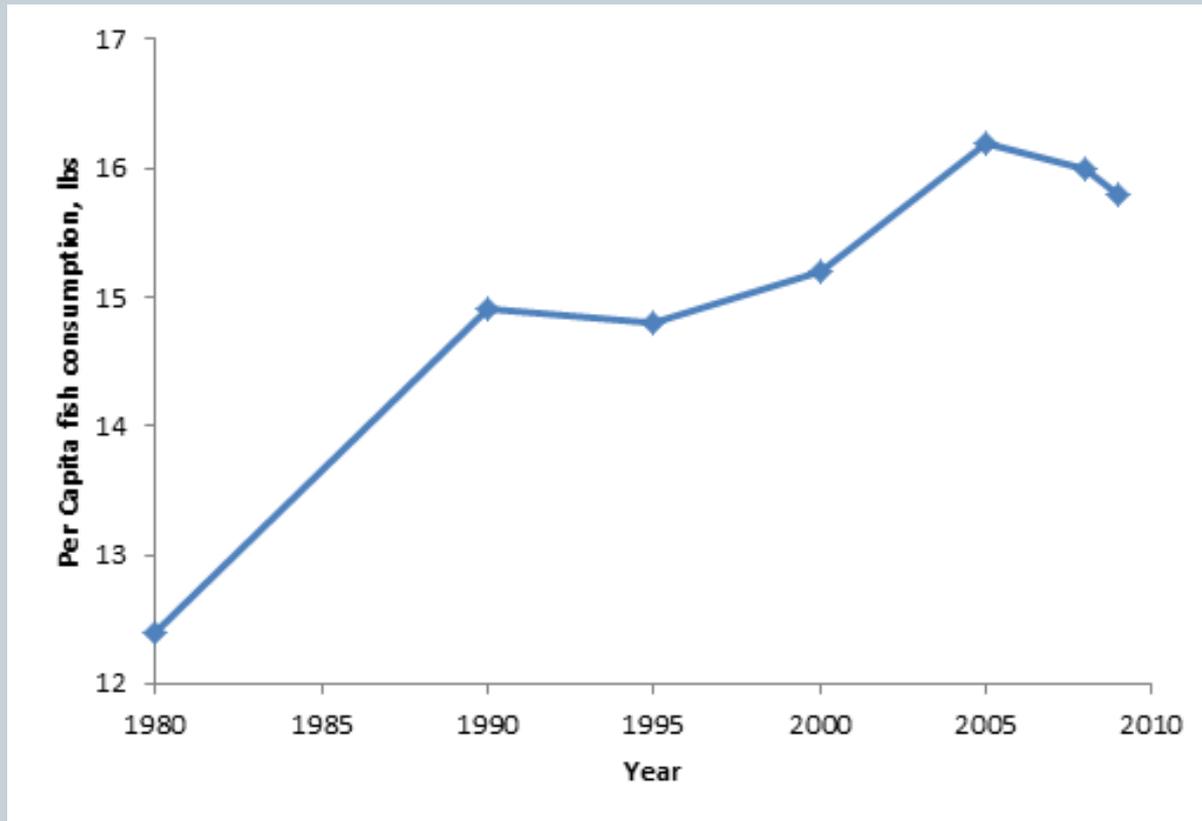
Thank You!

54

The Preliminary Draft Rule will be presented on **August 6, 2015**

The Proposed Rule will be published **Oct. 7, 2015**

Upward Spiral?





NMFS Disappearance Data Ranked by Seafood Type for 2004 and 1994

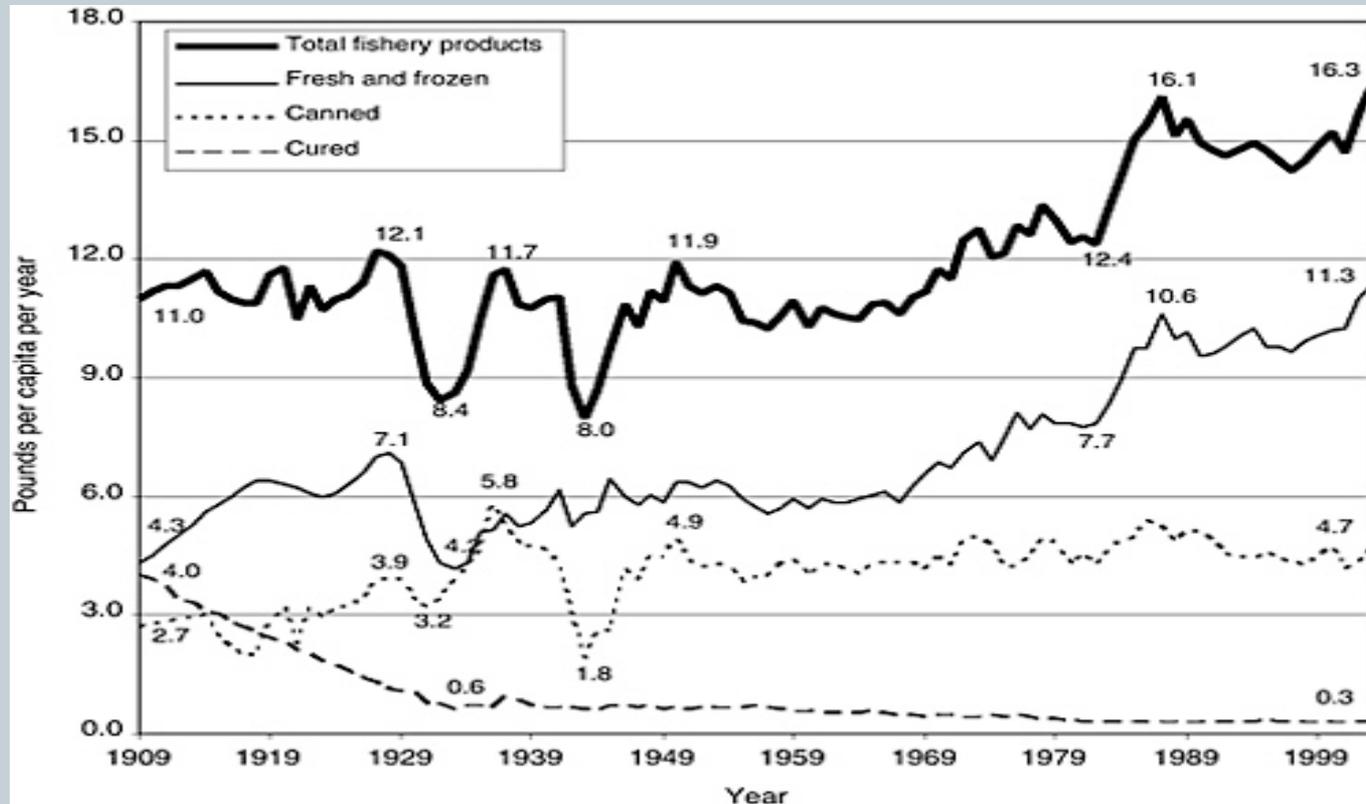
2004			1994	
Rank	Fish	Estimated Per Capita Consumption (pounds)	Fish	Estimated Per Capita Consumption (pounds)
1	Shrimp	4.2	Canned tuna	3.3
2	Canned tuna	3.3	Shrimp	2.5
3	Salmon	2.2	Pollock	1.5
4	Pollock	1.3	Salmon	1.1
5	Catfish	1.1	Cod	0.9
6	Tilapia	0.7	Catfish	0.9
7	Crab	0.6	Clams	0.5
8	Cod	0.6	Flatfish	0.4
9	Clams	0.5	Crab	0.3
10	Flatfish ^a	0.3	Scallops	0.3

NOTES: The figures are calculated on the basis of raw, edible meat, that is, excluding such offals as bones, viscera, and shells. Excludes game fish consumption.

^aIncludes flounder and sole.

SOURCE: NFI, 2005.

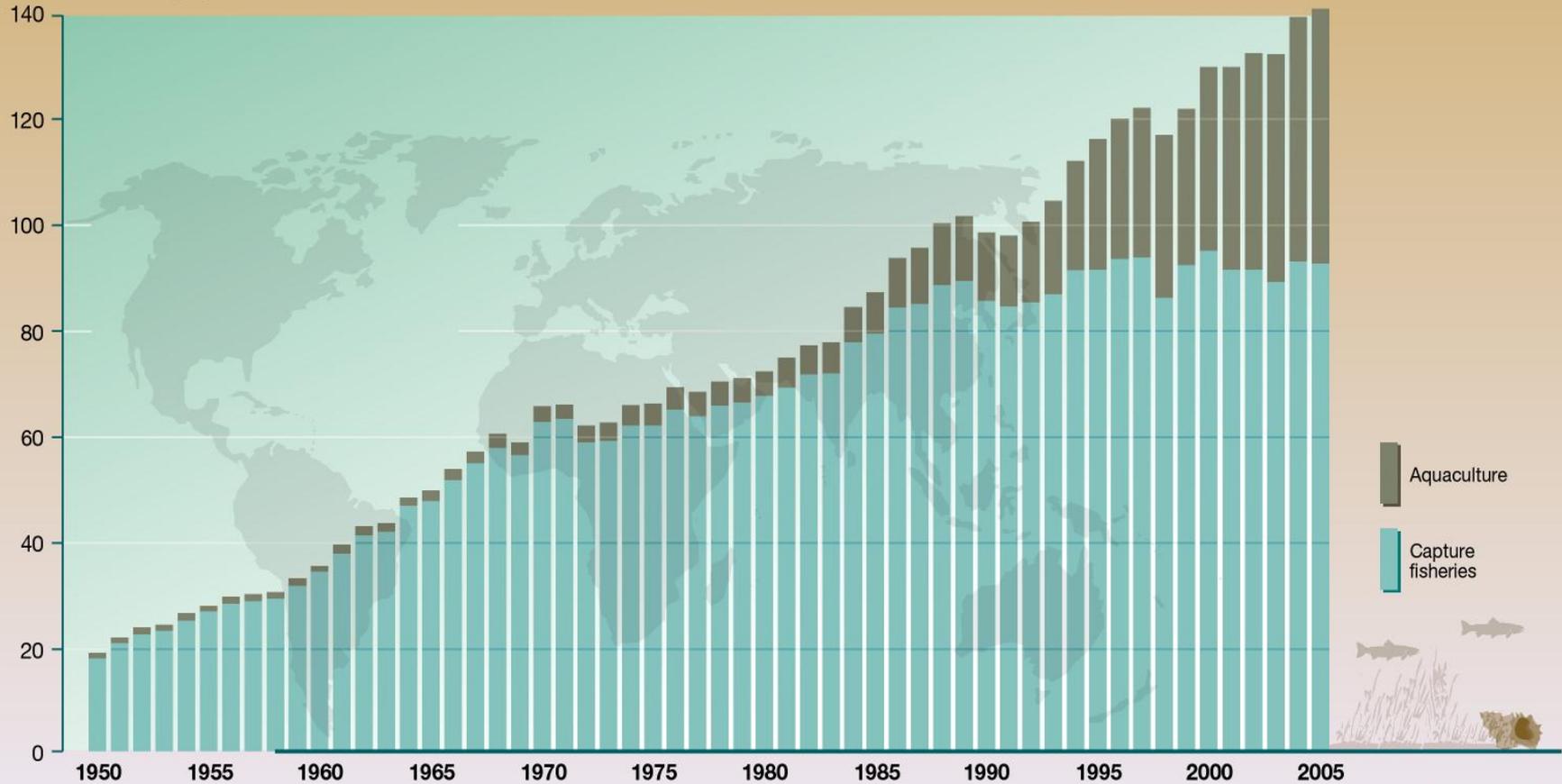
Trends in US Consumption of Fish



Fisheries Trends



Million tonnes (Mt)



Source: *The State of World Fisheries and Aquaculture 2000*, Food and Agriculture Organisation of the United Nations (FAO).

PHILIPPE REKACEWICZ
MARCH 2008