OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

Process to Identify High Contaminant Water Bodies to Prioritize Monitoring for Fish Advisory Development

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LIST OF ACRONYMS AND ABBREVIATIONS

CDFW	California Department of Fish and Wildlife
CEDEN	California Environmental Data Exchange Network
CES	CalEnviroScreen
Hg	mercury
OEHHA	Office of Environmental Health Hazard Assessment
PCBs	polychlorinated biphenyls
ppb	parts per billion
RWQCB	Regional Water Quality Control Board

PREFACE

The Office of Environmental Health Hazard Assessment (OEHHA), a department in the California Environmental Protection Agency, is responsible for evaluating potential public health risks from chemical contamination of sport fish.[1] This includes issuing fish consumption advisories, when appropriate, for the State of California. OEHHA's authorities to conduct these activities are based on mandates in the:

- California Health and Safety Code
  - Section 59009, to protect public health
  - Section 59011, to advise local health authorities
- California Water Code
  - Section 13177.5, to issue health advisories.

The health advisories are published in the California Department of Fish and Wildlife's (CDFW) Inland and Ocean Sport Fishing Regulations in their respective sections on public health advisories.[2]

This report presents a process implemented by OEHHA to identify water bodies with higher than typical contaminant levels in fish tissue to prioritize monitoring for fish advisory development.

[1] Sport fish includes all fish and shellfish caught from California waters for non-commercial purposes (e.g., recreational, tribal/cultural, and subsistence practices).
[2] CDFW's Inland and Ocean Sport Fishing Regulations can be found online at: https://wildlife.ca.gov/Fishing/Inland and https://wildlife.ca.gov/Fishing/Ocean, respectively.

BACKGROUND

The Office of Environmental Health Hazard Assessment (OEHHA) develops fish advisories to provide safe eating guidelines for people who catch and eat fish and shellfish from California water bodies. Various state and regional monitoring programs provide the majority of fish contaminant data that are used to develop fish advisories. When these data are uploaded into the California Data Exchange Network (CEDEN)[3] or otherwise provided to OEHHA, they can be evaluated for advisory development.

OEHHA has general requirements for sport fish sampling and analysis to support the development of fish consumption advisories, which are described in its sampling and analysis protocol.[4] In 2023, OEHHA published a report presenting its process to prioritize water bodies for developing or updating fish advisories when there are sufficient data that meet its sampling guidelines.[5] This companion document presents the process OEHHA uses to identify and prioritize water bodies with higher than typical contaminant concentrations in fish tissue, for which developing a new advisory or updating an existing advisory would require additional sampling. A hypothetical data set is provided to illustrate the prioritization process.

PROCESS FOR PRIORITIZING HIGH CONTAMINANT WATER BODIES FOR ADDITIONAL SAMPLING

ANNUAL REVIEW OF FISH TISSUE DATA

OEHHA reviews all fish contaminant data available in CEDEN annually. OEHHA also considers and includes data from other sources, as appropriate.[6] All data used in advisory development must be of sufficient quality and detail, as described in OEHHA's sampling and analysis protocol. Data are selected based on several criteria, including the following:

- analyte measured (either total mercury [Hg] or polychlorinated biphenyl [PCB] congeners)
- location[7]
- total length above legal or "edible" size
- tissue type and preparation
    - tissue type is typically fillet for finfish or meat for shellfish

[3] Online at: http://ceden.waterboards.ca.gov/AdvancedQueryTool.
[4] The Protocol for Fish Sampling and Analysis to Support the Development of Fish Advisories in California (OEHHA, 2022). https://oehha.ca.gov/media/downloads/fish/report/fishadvisorysamplinganalysisprotocolreport2022.pdf
[5] Water Body Prioritization Process for Developing or Updating Fish Advisories (OEHHA, 2023). https://oehha.ca.gov/media/downloads/fish/report/fishadvisoryprioritizationprocessreport2023.pdf
[6] Example sources include federal agencies, public utility companies, and academic research institutions.
[7] Marine water bodies and freshwater bodies are prioritized separately.

- sample preparation is skin-off or on; whole body or fillet[8]

OEHHA compiles the data available for the various water bodies in the state into a data set. The data set is refined by filling in missing information (such as total length when it can be obtained from the original data source), grouping species (e.g., "Largemouth Bass" to "Black Bass Species"), removing duplicate records, converting dry weight to wet weight (as necessary), and removing PCB data on samples collected prior to the year 2000.[9] The various station names that may have been used while sampling a water body are consolidated into a standardized name and assigned to a Water Board region[10] and county. OEHHA then calculates maximum concentrations and weighted means for Hg and PCBs and sums the total number of fish for each species or species group by water body.

Once the data are complied, OEHHA prioritizes the water bodies for additional sampling based on fish contaminant levels.

IDENTIFICATION OF WATER BODIES WITH HIGHER THAN TYPICAL FISH TISSUE CONTAMINANT CONCENTRATIONS

In addition to prioritizing water bodies for developing a new advisory or updating an existing advisory, OEHHA also identifies water bodies with higher than typical fish tissue contaminant concentrations. State or regional monitoring programs can use this information to inform their plans for sample collection. Data for each water body are evaluated based on the following considerations:

- Did the mean contaminant concentrations for a species meet or exceed the statewide 90th percentiles for Hg (Table 1) and/or PCBs (Table 2) established for lakes/reservoirs[11] or flowing waters?[12]
  - The contaminant data are considered only when they can support the most health-protective advice for that species at a water body.
- Did the maximum Hg and/or PCB concentrations for a species exceed the "do not consume" concentrations for the general population (1,310 and 120 parts per billion, or ppb, respectively)?

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[8] Some whole body and skin-on samples are used in advisory development per OEHHA (2022).
[9] Data for organic chemicals (chlordanes, DDTs, dieldrin, PCBs or toxaphene) generated prior to 2000 are excluded from the analysis because data that are more recent are considered more reliable due to improved analytical methods and are likely to be more representative of fish caught today.
[10] Online at: https://www.waterboards.ca.gov/waterboards_map.html.
[11] The calculation method for the 90th percentile values for lakes/reservoirs is described in OEHHA (2021): Statewide Health Advisory and Guidelines for Eating Fish from California's Lakes and Reservoirs without Site-Specific Advice. https://oehha.ca.gov/media/downloads/advisories/fishadvisorystatewidelakesreport2021.pdf
[12] The calculation method for the 90th percentile species values for flowing waters is described in OEHHA (2022): Statewide Health Advisory and Guidelines for Eating Fish from California's Rivers, Streams, and Creeks without Site-Specific Advice. https://oehha.ca.gov/media/downloads/advisories/fishadvisorystatewideriversreport2022.pdf

- Would the advice for any species at the water body be more restrictive than the advice for the same species in the statewide advisory?

Statewide 90th percentile concentrations for Hg and/or PCBs are not available for all species. In those cases, concentrations are compared to the 90th percentiles for a closely related species (e.g., Blue Catfish may be compared to other catfish species).

Data can be tabulated separately for two types of water bodies (lakes/reservoirs and flowing waters) with and without an advisory. To illustrate this process, a hypothetical summary data set for California lakes and rivers is provided in Table 3. These data were evaluated using the metrics listed above and an example output is shown in Table 4.

Once a list of high contaminant water bodies has been established based on the criteria above, the following factors can be considered to prioritize them for monitoring:

- Water bodies with the highest percent exceedance compared to the statewide 90th percentile for any species or the most species with exceedances within a water body.
- Number of species included in the advisory (for water bodies with existing advisories).
    - A water body that has an advisory with fewer species (e.g., 1 to 4) is generally a higher priority for additional sampling than those with many species.
- CalEnviroScreen (CES) score of the surrounding area or distance to the closest water body with an advisory.[13]
- Input from the Safe to Eat Workgroup (STEW), Regional Water Quality Controls Boards (Regional Water Boards, or RWQCBs) or other stakeholders.

[13] For further discussion see OEHHA (2023): Water Body Prioritization Process for Developing or Updating Fish Advisories.
https://oehha.ca.gov/media/downloads/fish/report/fishadvisoryprioritizationprocessreport2023.pdf

TABLE 1. SPECIES MERCURY 90TH PERCENTILE CONCENTRATIONS (WET WEIGHT, PPB)

Species	Lakes	Flowing Waters
Black Bass Species	845	1,050
Brown Trout	402	314
Bullhead Species	249	213
Catfish Species	488	554
Common Carp, Goldfish	400	479
Crappie Species	367	n/a
Rainbow Trout	133	154
Sacramento Pikeminnow	1,360	1,200
Sacramento Sucker	549	423
Striped Bass	1,035	711
Sunfish Species	276	309

n/a = not applicable due to insufficient samples.

TABLE 2. SPECIES PCB 90TH PERCENTILE CONCENTRATIONS (WET WEIGHT, PPB)

Species	Lakes	Flowing Waters
Black Bass Species	12	19
Brown Trout	19	11
Bullhead Species	8	4
Catfish Species	50	52
Common Carp, Goldfish	64	34
Crappie Species	1	n/a
Rainbow Trout	4	13
Sacramento Pikeminnow	n/a	30
Sacramento Sucker	14	44
Striped Bass	22	76
Sunfish Species	3	2

n/a = not applicable due to insufficient samples.

TABLE 3. HYPOTHETICAL DATA SET SUMMARY BY WATER BODY AND SPECIES

Water Body Name	Water Body Type and Advisory Status	Species	Mercury			PCBs		
			Number of Fish	Mean Concentration (ww, ppb)	Maximum Concentration (ww, ppb)	Number of Fish	Mean Concentration (ww, ppb)	Maximum Concentration (ww, ppb)
Lake X	Lakes and Reservoirs without Advisory	Black Bass Species	25	900	1,400	20	5	10
		Common Carp	30	300	350	25	70	90
		Catfish Species	30	1,230	1,400	30	10	15
		Brown Trout	50	410	420	45	0	5
Lake Y	Lakes and Reservoirs with Advisory	Black Bass Species	20	800	1,500	20	5	10
		Catfish Species	45	850	1,400	40	20	25
		Common Carp	50	200	220	50	48	130
		Sunfish Species	35	290	320	30	0	0
River X	Flowing Waters without Advisory	Black Bullhead	60	1,200	1,400	60	0	0
		Sunfish Species	20	340	350	15	0	0
		Striped Bass	25	800	1,490	20	10	20
River Y	Flowing Waters with Advisory	Sacramento Sucker	45	350	360	45	100	150
		Brown Trout	20	100	120	15	20	25
		Striped Bass	40	1,280	1,400	20	15	25

Hg = mercury, PCBs = polychlorinated biphenyls, ppb = parts per billion, ww = wet weight

TABLE 4. HYPOTHETICAL EXAMPLE OF OUTPUT FROM HIGH CONTAMINANT WATER BODY PRIORITIZATION ANALYSIS

Water Body Name	Water Body Type and Advisory Status	Is Advice More Restrictive than Statewide Advice for Any Species?	Maximum Concentration Exceeds 1,310 ppb for Hg or 120 ppb for PCBs[a]	Mean Concentration ≥ Statewide 90th percentile
Lake X	Lakes and Reservoirs without Advisory	N	Black Bass Species (Hg) Catfish Species (Hg)	Black Bass Species (Hg) Brown Trout (Hg) Catfish Species (Hg) Common Carp (PCBs)
Lake Y	Lakes and Reservoirs with Advisory	N	Black Bass Species (Hg) Catfish Species (Hg) Common Carp (PCBs)	Catfish Species (Hg) Sunfish Species (Hg)
River X	Flowing Waters without Advisory	Y	Black Bullhead (Hg) Striped Bass (Hg)	Black Bullhead (Hg) Sunfish Species (Hg) Striped Bass (Hg)
River Y	Flowing Waters with Advisory	N	Sacramento Sucker (PCBs) Striped Bass (Hg)	Brown Trout (PCBs) Sacramento Sucker (PCBs) Striped Bass (Hg)

Hg = mercury, PCBs = polychlorinated biphenyls, ppb = parts per billion

[a] 1,310 ppb (Hg) and 120 ppb (PCBs) are the chemical concentrations that correspond to do not consume advice for the general population.

Based on this hypothetical analysis, OEHHA would suggest further sampling of:

- Black Bass species (Hg), Brown Trout (Hg), Catfish species (Hg) and Common Carp (PCBs) from Lake X,
- Black Bass species (Hg), Catfish species (Hg), Common Carp (PCBs) and Sunfish species (Hg) from Lake Y,
- Black Bullhead (Hg), Sunfish species (Hg), and Striped Bass (Hg) from River X, and
- Brown Trout (PCBs), Crappie species (Hg), Sacramento Sucker (PCBs), and Striped Bass (Hg) from River Y.

CONCLUSION

OEHHA conducts an annual data review and considers several factors to prioritize water bodies for fish advisory development. Additionally, OEHHA will, on a regular basis, conduct the analyses described in this report to identify water bodies with higher than typical Hg and/or PCB concentrations in fish tissue where further sampling to develop or expand an advisory is warranted. This information will be provided to the State Water Resources Control Board to inform the bioaccumulation monitoring program. Several factors can be used to prioritize monitoring of affected water bodies. OEHHA can assist with developing monitoring priorities for individual water bodies with input from RWQCBs or other stakeholders.