OEHHA’s Fish Advisory Program

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OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

PFAS IN SAN FRANCISCO BAY FISH
FEBRUARY 4, 2022
The Office of Environmental Health Hazard Assessment (OEHHA) issues consumption advisories for recreationally-caught fish from water bodies throughout California, including state waters of the Pacific Ocean.

Fish advisories:

- are guidelines that recommend how often you can safely eat fish that you catch – from no consumption to 7 meals per week.
- use the best available science to balance the benefits and risks of eating fish.
- are based on thorough data review and best professional judgement.
- consider local/cultural practices, regulations, local fishing pressure, and environmental justice.
Fish Advisories

Good Catch California is the OEHHA fish advisory program. We provide advice so that you can make healthy choices about eating the fish you catch.

Fish Advisories are guidelines that recommend how often you can safely eat fish caught from water bodies in California. The Office of Environmental Health Hazard Assessment (OEHHA) offers over 100 site-specific advisories for lakes, rivers, bays, reservoirs, and the coast. For water bodies without site-specific advice, look for the appropriate statewide advisory below.

OEHHA provides two sets of guidelines for eating fish, one for each of the following populations:

- Women 18-49 years and children 1-17 years
- Women 50 years and older and men 18 years and older

General Information

- Fish Advisory Fact Sheet (PDF) English | Spanish (Español)
- How to Follow Advisories
- Women & Children
- General Tips

Statewide Advisories

- Statewide Advisory for Eating Fish from California’s Lakes and Reservoirs without site-specific advice
- Statewide Advisory for Eating Fish from California Coastal Locations without site-specific advice
- Advisory for Fish that Migrate
OEHHA provides two sets of guidelines for eating fish, one for each of the following populations:

- Women 18-49 years and children 1-17 years ("Sensitive population")
- Women 50+ years and men 18+ years ("General population")
OEHHA has two types of Advisories:

1) Site-specific advisories (132 and counting)
   - Require at least 3 species and 9 fish per species
   - Legal size to take
   - Adult size for species without legal size limits
   - Use a measure of central tendency for each species (usually the mean concentration)
   - Consider the range of concentrations
2) Statewide advisories

Statewide Advisory for Eating Fish from California’s Coastal Locations without Site-specific Advice

- Provides consumption advice for 36 species based on levels of mercury and/or PCBs

Statewide Advisory for Eating Fish from California’s Lakes and Reservoirs without Site-specific Advice

- Provides consumption advice for 14 species based on levels of mercury and/or PCBs

Advisory for Fish that Migrate

- Provides consumption advice for 5 species based on levels of mercury and/or PCBs

### Advisory for Eaters of 6-17 Years

<table>
<thead>
<tr>
<th>Fish Type</th>
<th>Mercury Level</th>
<th>PCB Level</th>
<th>Advice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmon</td>
<td>Very Low</td>
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</tr>
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**Choose the Right Fish**

- Check for advisories to avoid eating fish with high levels of mercury and/or PCBs.

**Avoid the Bad Fish**

- Avoid eating fish that are high in mercury and/or PCBs to prevent health problems in children and adults.
2) Statewide advisories

Statewide Advisory for Eating Fish from California’s Coastal Locations without Site-specific Advice

• Provides consumption advice for 36 species based on levels of mercury and/or PCBs

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Current Fish Consumption Advisories

<table>
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<tr>
<th>Risk Driver*</th>
<th>Percent of Advisories</th>
</tr>
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<tbody>
<tr>
<td>Mercury</td>
<td>97</td>
</tr>
<tr>
<td>PCBs</td>
<td>40</td>
</tr>
<tr>
<td>Selenium</td>
<td>8</td>
</tr>
<tr>
<td>DDTs</td>
<td>5</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>4</td>
</tr>
<tr>
<td>PBDEs</td>
<td>1</td>
</tr>
</tbody>
</table>

*Consumption advice is based on the chemical with the lowest allowable number of servings per week ("risk driver"). More than one risk driver may affect advice in a single advisory.

Total number of advisories – 135
San Francisco Bay

- Fish Advisory Posters in the following languages
  - Simplified and Traditional Chinese
  - Japanese
  - Khmer
  - Korean
  - Laotian
  - Russian
  - Samoan
  - Spanish
  - Tagalog
  - Vietnamese
- Brochures
- Fact Sheets
- Technical Report
A GUIDE TO EATING FISH from SAN FRANCISCO BAY
(ALAMEDA, CONTRA COSTA, MARIN, NAPA, SAN FRANCISCO, SAN MATEO, SANTA CLARA, SOLANO, SONOMA COUNTIES)

WOMEN 18 - 49 YEARS AND CHILDREN 1 - 17 YEARS

**Eat the Good Fish**
Eating fish that are low in chemicals may provide health benefits to children and adults.

**Avoid the Bad Fish**
Eating fish with higher levels of chemicals like mercury or PCBs may cause health problems in children and adults.

**Choose the Right Fish**
Chemicals may be more harmful to unborn babies and children.

**Women (18-49 Years)**
2 TOTAL SERVINGS A WEEK

**Children (1-17 Years)**
1 TOTAL SERVING A WEEK

0 DO NOT EAT

### Serving Size
A serving of fish is about the size and thickness of your hand. Give children smaller servings.

### For Adults
- **Brown rockfish**
- **Chinook (King) Salmon**
- **Jacksnelt**
- **Red rock crab**
- **California halibut**
- **White croaker**
- **Sharks**
- **White sturgeon**
- **Surflperches**
- **Striped Bass**

### For Children
- Some chemicals are higher in the skin, fat, and gills.
- Eat only the skinless fillet
- Eat only the meat

**California Office of Environmental Health Hazard Assessment**
web: www.oehha.ca.gov/fish
email: fish@oehha.ca.gov
phone: (916) 324-7572

OEHHA 02042022
A GUIDE TO EATING FISH from SAN FRANCISCO BAY
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WOMEN 18 - 49 YEARS AND CHILDREN 1 - 17 YEARS

Eat the Good Fish Eat fish that are low in chemcials may provide health benefits to children and adults.

Avoid the Bad Fish Eating fish with higher levels of chemicals like mercury or PCBs may cause health problems in children and adults.

Choose the Right Fish Chemcials may be more harmful to unborn babies and children.

TOTAL SERVINGS A WEEK
2
OR
1
TOTAL SERVING A WEEK
0
DO NOT EAT

Brown rockfish
Chinook (King) Salmon
Jacksmeat
Red rock crab

California halibut
White croaker
Sharks
White sturgeon
Surfperches
Striped Bass

Serving Size
A serving of fish is about the size and thickness of your hand. Give children smaller servings.

For Adults
For Children
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OEHHA 02042022 12
### A Guide to Eating Fish from San Francisco Bay

#### Women (18-49 Years) and Children (1-17 Years)

<table>
<thead>
<tr>
<th>Serving Size</th>
<th>For Adults</th>
<th>For Children</th>
<th>Avoid the Bad Fish</th>
<th>Choose the Right Fish</th>
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<tr>
<td>A serving of fish is about the size and thickness of your hand. Give children smaller servings.</td>
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**Brown rockfish**, **Chinook (King) Salmon**, **Jacksmeat**, **Red rock crab**

**California halibut**, **White croaker**, **Sharks**, **White sturgeon**, **Surfperches**, **Striped Bass**

**Eat the Good Fish**

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A GUIDE TO EATING FISH from SAN FRANCISCO BAY

(WOMEN 18 - 49 YEARS AND CHILDREN 1 - 17 YEARS)

**Women (18-49 Years)**
- **2 TOTAL SERVINGS A WEEK**
- **OR**
- **1 TOTAL SERVING A WEEK**
- **0 DO NOT EAT**

**Eat the Good Fish**
- Brown rockfish
- Chinook (King) Salmon

**Avoid the Bad Fish**
- Jacksmelt
- Red rock crab

**Choose the Right Fish**
- California halibut
- White croaker
- Sharks
- White sturgeon
- Surperches
- Striped Bass

**Serving Size**
- A serving of fish is about the size and thickness of your hand. Give children smaller servings.

**For Adults**
- Eat only the skinless fillet
- Eat only the meat

**For Children**
- Some chemicals are higher in the skin, fat, and gills.

(OEHHA 02042022)
A GUIDE TO EATING FISH from SAN FRANCISCO BAY

(WOMEN 18 - 49 YEARS AND CHILDREN 1 - 17 YEARS)

Women (18-49 Years)
Children (1-17 Years)

2 TOTAL SERVINGS A WEEK

1 TOTAL SERVING A WEEK

OR

0 DO NOT EAT

Brown rockfish
Chinook (King) Salmon
Jacksmelt
Red rock crab

California halibut
White croaker

Sharks
White sturgeon
Surperches
Striped Bass

Serving Size
A serving of fish is about the size and thickness of your hand. Give children smaller servings.

For Adults
For Children

Eat the Good Fish
Eating fish that are low in chemicals may provide health benefits to children and adults.

Avoid the Bad Fish
Eating fish with higher levels of chemicals like mercury or PCBs may cause health problems in children and adults.

Choose the Right Fish
Chemicals may be more harmful to unborn babies and children.

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WOMEN 18 - 49 YEARS AND CHILDREN 1 - 17 YEARS

- **Women (18-49 Years)**
- **Children (1-17 Years)**

**2 TOTAL SERVINGS A WEEK**

**1 TOTAL SERVING A WEEK**

**0 DO NOT EAT**

- **Eat the Good Fish**
  - Eating fish that are low in chemicals can provide health benefits to children and adults.

- **Avoid the Bad Fish**
  - Eating fish with higher levels of chemicals like mercury or PCBs may cause health problems in children and adults.

- **Choose the Right Fish**
  - Chemicals may be more harmful to unborn babies and children.

- **Brown rockfish**
- **Chinook (King) Salmon**
- **Jacksmelt**
- **Red rock crab**
- **California halibut**
- **White croaker**
- **Sharks**
- **White sturgeon**
- **Tunas**
- **Striped Bass**
- **Eat only the skinless fillet**
- **Eat only the meat**

**Serving Size**
- For Adults: A serving of fish is about the size and thickness of your hand. Give children smaller servings.
- For Children: Some chemicals are higher in the skin, head, and gills.

[For more information, visit www.oehha.ca.gov/fish]
# A Guide to Eating Fish from San Francisco Bay

## Women 18 - 49 Years and Children 1 - 17 Years

<table>
<thead>
<tr>
<th>Women (18-49 Years)</th>
<th>Children (1-17 Years)</th>
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<tbody>
<tr>
<td><strong>2</strong> TOTAL SERVINGS A WEEK</td>
<td><strong>1</strong> TOTAL SERVING A WEEK</td>
</tr>
<tr>
<td>OR</td>
<td>DO NOT EAT</td>
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## Serving Size
A serving of fish is about the size and thickness of your hand. Give children smaller servings.

<table>
<thead>
<tr>
<th>Serving Size</th>
<th>For Adults</th>
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<th>For Skinless Fillet</th>
<th>For Meat</th>
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## Eat the Good Fish
Eating fish that are low in chemicals may provide health benefits to children and adults.

- **Brown rockfish**
- **Chinook (King) Salmon**
- **California halibut**
- **Sharks**
- **White sturgeon**
- **Surfperches**
- **Striped Bass**

- **White croaker**
- **Jacks**
- **Red rock crab**

## Avoid the Bad Fish
Eating fish with higher levels of chemicals like mercury and PCBs may cause health problems in children and adults.

- **Jacksmelt**

## Choose the Right Fish
Chemicals may be more harmful to unborn babies and children.

- **Brown rockfish**
- **Chinook (King) Salmon**
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(ALAMEDA, CONTRA COSTA, MARIN, NAPA, SAN FRANCISCO, SAN MATEO, SANTA CLARA, SOLANO, SONOMA-COUNTIES)

WOMEN 18 - 49 YEARS AND CHILDREN 1 - 17 YEARS

Eat the Good Fish
Eating fish that are low in chemicals may provide health benefits to children and adults.

Avoid the Bad Fish
Eating fish with higher levels of chemicals like mercury or PCBs may cause health problems in children and adults.

Choose the Right Fish
Chemicals may be more harmful to unborn babies and children.

**Women (18-45 Years)**

- **TOTAL SERVINGS A WEEK**
  - 2

- **TOTAL SERVING A WEEK**
  - 1

- **DO NOT EAT**
  - 0

**Children (1-17 Years)**

- **TOTAL SERVINGS A WEEK**
  - 2

- **TOTAL SERVING A WEEK**
  - 1

- **DO NOT EAT**
  - 0

- **Serving Size**
  - A serving of fish is about the size and thickness of your hand. Give children smaller servings.

- **For Adults**
  - Eat only the skinless fillet

- **For Children**
  - Eat only the meat

- **California Halibut
  - White sturgeon
  - Striped Bass
  - White croaker
  - Jacksmelt
  - Shvisks
  - White sturgeon
  - Surmacher

**California Office of Environmental Health Hazard Assessment**

- [www.oehha.ca.gov](http://www.oehha.ca.gov)

- [fax](fax): 916-445-7027

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A GUIDE TO EATING FISH from SAN FRANCISCO BAY
(ALAMEDA, CONTRA COSTA, MARIN, NAPA, SAN FRANCISCO, SAN MATEO, SANTA CLARA, SOLANO, SONOMA-COUNTIES)

WOMEN 50 YEARS AND OLDER AND MEN 18 YEARS AND OLDER

Eat the Good Fish
Eating fish that are low in chemicals may provide health benefits to children and adults.

Avoid the Bad Fish
Eating fish with higher levels of chemicals like mercury or PCBs may cause health problems in children and adults.

Choose the Right Fish
Chemicals may be more harmful to unborn babies and children.

**Women (50+ Years)**

- **TOTAL SERVINGS A WEEK**
  - 7

- **TOTAL SERVING A WEEK**
  - 5

- **DO NOT EAT**
  - 2

**Men (18+ Years)**

- **TOTAL SERVINGS A WEEK**
  - 1

- **DO NOT EAT**
  - 0

- **Serving Size**
  - A serving of fish is about the size and thickness of your hand. Give children smaller servings.

- **For Adults**
  - Eat only the skinless fillet

- **For Children**
  - Eat only the meat

- **California Halibut
  - White sturgeon
  - Striped Bass
  - White croaker
  - Jacksmelt
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18
Advisories are developed through a multi-step process:
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- Fish samples are collected
  - The Safe to Eat Workgroup (STEW) arranges the collection for the majority of fish samples used in advisory development
  - Additional samples are collected by water utilities, FERC (Federal Energy Regulation Commission) relicensing, and other GOs and NGOs
Advisories are developed through a multi-step process:

- Fish samples are generally analyzed at Moss Landing Marine Laboratories and/or contracted to other certified laboratories
Advisories are developed through a multi-step process:

• Most fish contaminant data are uploaded to the California Environmental Data Exchange Network (CEDEN) and retrieved by OEHHA for use in fish advisory development.
Advisories are developed through a multi-step process:

- Data that meet our criteria (minimum length, sample size, and quality) are reviewed, analyzed, and interpreted before a final data set is confirmed and used to calculate a **tissue concentration** for each chemical in each species at a water body.
Tissue concentrations are compared to Advisory Tissue Levels (ATLs) that have been developed for each chemical.

ATLs:
- provide a number of recommended servings (0-7 per week) based on the range of contaminant concentrations found in fish.
- are designed to encourage consumption of fish that can be eaten in quantities likely to provide health benefits (8 ounces per week or 32 grams per day, prior to cooking).
- are designed to discourage consumption of fish that should not be eaten in amounts recommended for improving overall health.
- are not “bright lines” but part of a complex decision-making process.
- can be based on cancer or non-cancer endpoints.
How does OEHHA develop ATLs?

• ATLs are developed using risk assessment equations for cancer and non-cancer endpoints.

• The following terms use default assumptions for both equations:
  • Body weight (BW) – assumed adult body weight of 70 kg (154 lbs);
  • Consumption Rate (CR) – corresponding to 1 – 7 eight ounce servings per week;
  • Cooking Reduction Factor (CRF) – a factor of 0.7 is used to account for the loss of organic contaminants during cooking.
Advisory Tissue Level (ATL) Equations: Non-cancer

**Reference Dose (RfD)**
- Chemical specific dose
- Adverse health effects are not likely to occur below this concentration

\[
\text{ATLs} = \frac{\text{RfD} \times \text{BW}}{\text{CR} \times \text{CRF}}
\]
Advisory Tissue Level (ATL) Equations: Cancer

**Cancer Slope Factor (CSF)**
- Cancer risk from lifetime exposure

**Exposure Durations (ED)**
- 30 years of exposure

**Averaging Time (AT)**
- 70 year average lifetime

**Risk Level (RL)**
- 1 in 10,000 (1 x 10⁻⁴) is used to balance benefits and risks of eating fish.

\[
ATLs = \frac{RL \times BW}{CSF \times (ED/AT) \times CR \times CRF}
\]
ATLs have been developed for:

Natural elements
- Mercury – a global contaminant and legacy of California’s gold and mercury mining.
- Selenium – a micro-nutrient that can be redistributed and concentrated as a result of human activity.

Industrial chemicals
- Polychlorinated biphenyls (PCBs) – banned in the 1970s; still pervasive in some areas.
- Polybrominated diphenyl ethers (PBDEs) – flame retardants; some forms are no longer produced.

Pesticides
- DDTs – banned in the 1970s; still present in some environments.
- Dieldrin – banned in the 1970s; still present in some environments.
- Chlordane* – banned in the 1970s.

*These chemicals are not currently found at levels of concern in California sport fish.
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Multiple Chemical Exposure

• Some chemicals, such as mercury and PCBs, are known to have similar adverse effects, and in such cases may be assessed using multiple chemical exposure methodology.

• If two or more chemicals with similar adverse effects are present in fish tissue, multiple chemical exposure methodology is employed. This may result in advising fewer servings per week than would be the case for the presence of one chemical alone, in a similar concentration.
Advisories are developed through a multi-step process:

- A final report and posters are developed and posted at: https://oehha.ca.gov/fish/advisories
A GUIDE TO EATING FISH from SAN FRANCISCO BAY
(ALAMEDA, CONTRA COSTA, MARIN, NAPA, SAN FRANCISCO, SAN MATEO, SANTA CLARA, SOLANO, SONOMA-COUNTIES)

WOMEN 18 - 49 YEARS AND CHILDREN 1 - 17 YEARS

- Eat the Good Fish: Eating fish that are low in chemicals may provide health benefits to children and adults.
- Avoid the Bad Fish: Eating fish with higher levels of chemicals like mercury or PCBs may cause health problems in children and adults.
- Choose the Right Fish: Chemicals may be more harmful to unborn babies and children.

Women (18-49 years)
- 2 TOTAL SERVINGS A WEEK
- OR
- 1 TOTAL SERVING A WEEK
- DO NOT EAT

Children (1-17 years)
- 0 TOTAL SERVINGS A WEEK

- Brown rockfish
- Chinook (King) Salmon
- Jacksmelt
- Red rock crab
- California halibut
- White croaker
- Sharks
- White sturgeon
- Surfperches
- Striped Bass

Serving Size: A serving of fish is about the size and thickness of your hand. Give children smaller servings.

For Adults
Eat only the skinless fillet

For Children
Eat only the meat

Some chemicals are higher in the skin, fat, and gills.

California Office of Environmental Health Hazard Assessment
Website: www.oehha.ca.gov/email: fish@oehha.ca.gov/Phone: (916) 324-7522
Eat the Good Fish, Avoid the Bad Fish, Choose the Right Fish.

Wesley.smith@oehha.ca.gov

www.oehha.ca.gov/fish