

MERCURY LEVELS IN NEARSHORE FISH FROM THE CENTRAL COAST AREA: IMPORTANT INFORMATION FOR FISH CONSUMERS

What is the issue?

Several species of marine fish commonly caught in nearshore Central Coast waters may contain high levels of mercury. Several rockfish species, especially Black-and-Yellow, China, Copper, and Gopher, and sharks and bat rays are species of concern. People who routinely consume fish from nearshore waters are advised to follow the recent statewide coastal advisory released in November 2016 by the California Office of Environmental Health Hazard Assessment (OEHHA) regarding consumption of these and other species. The advisory recommends “no consumption” of several fish species for women 18-45 years and for children 1-17 years, and limiting consumption of some species for all population groups. The advisory can be found online at <http://oehha.ca.gov/advisories/statewide-advisory-eating-fish-california-coastal-locations-without-site-specific-advice>. Site-specific advice was also developed for Elkhorn Slough, and can be viewed at <http://oehha.ca.gov/advisories/elkhorn-slough>.

What are the details?

In May, 2012, California’s Surface Water Ambient Monitoring Program (SWAMP) released a report on coastal fish contamination, entitled *Contaminants in Fish From the California Coast, 2009-2010: Summary Report on a Two-Year Screening Survey*. The report evaluated coastal fish tissue chemistry data for a number of commonly caught sport and commercial fish species. The report showed high levels of mercury in some species of fish in central and northern California. Nearly all (>95%) of the mercury present in whole fish and fish fillets is in the form of methylmercury (Davis, et al., 2012) so, though the study measured total mercury in fish tissue, the study assumes all mercury present is in the form of the highly absorbable “methylmercury”, to be most protective of human health. The purpose of this fact sheet is to highlight the findings of

SWAMP’s coastwide studies of commonly caught nearshore fish show that mercury in some species are at times over levels safe for consumption, particularly by children and pregnant women. This fact sheet describes the study findings in the Central Coast and the species of most concern for people who enjoy eating locally caught fish.

the statewide report and OEHHA advisory related to mercury in the Central Coast Region, which stretches from Gazos Creek in southern San Mateo County south to Rincon Creek in northern Ventura County.

Mercury Levels of Concern in Fish Tissue

Because the fetus and children are more sensitive to the harmful effects of mercury, for this chemical OEHHA provides separate, more restrictive fish consumption advice for women of childbearing age (typically 18-45 years) and children (the “sensitive population”), and women 46 years and older and men 18 years and older (the “general population”). OEHHA recommends that the sensitive population not consume fish when the mercury concentration is greater than 0.44 parts per million (ppm). OEHHA advises that the sensitive population may eat one, two, or three servings per week when mercury concentrations range from >0.15 to 0.44 ppm, >0.07 to 0.15 ppm, and >0.055 to 0.07 ppm, respectively. The SWAMP report uses the advisory thresholds to establish three categories:

Red represents a “high contamination” category, where average fish tissue concentrations are above the “no consumption” threshold of 0.44 ppm; **Yellow** represents “moderate contamination”, where average tissue concentrations are higher than the “three servings per week” range but lower than the “no consumption” level; and **Green** represents “low contamination”, where average fish tissue concentrations are in the “three serving per week” range (less than 0.07 ppm).



Gopher Rockfish photo by Lt. John Croft, Pt. Lobos, Monterey Co. NOAA Photo Library.

Data Findings

The SWAMP study extended across the entire California coast. Samples were collected from 68 locations statewide. At twenty-five of these locations (37%), the average concentration for at least one species was in the “high contamination” category for mercury. In northern California (Sonoma County and north), the average concentration for all Copper, Gopher, and China rockfish samples, and all shark samples fell in the “high contamination” category. Statewide, all 41 Leopard Shark analyzed exceeded the “no consumption” level for the sensitive population group, with an overall tissue average of 1.27 ppm (almost three times the “no consumption” level for the sensitive population group); these fish were collected from six estuaries from Morro Bay north to Humboldt Bay. South of Port San Luis, only shark species fell in the “high contamination” category. Overall, less mercury was found in samples from southern California. This may be due to the species collected as well as the smaller size and younger age of fish sampled. Higher concentrations in rockfish were found in larger, older fish, particularly in copper rockfish. Pelagic rockfish (Black, Blue, and Olive), meaning those living and feeding in mid-water, had lower concentrations of mercury than species of rockfish found closer to the ocean floor.



Leopard Shark photo – Licensed under Creative Commons

In the Central Coast Region (shown in Figure 1), seventeen locations were sampled and seven locations (35%) had at least one species with average concentrations in the “high contamination” category. Diablo Canyon Coast and Carmel Coast each had two species averages in the red “high contamination” category. All six locations with “high contamination” species were north of Port San Luis. All sites had at least one species in the “moderate contamination” category. Only Shiner Surfperch, White Surfperch and Topsmelt fell consistently in the “low contamination” category (Table 1).



Figure 1. Map of the Central Coast Region with fish sampling zones identified by number (corresponding with zone numbers in Table 1). Red indicates at least one species had average tissue mercury concentrations in the “high contamination” category. Yellow indicates at least one fish species had average tissue concentrations in the “moderate contamination” category. No sites were “green”, which would mean that tissue concentration averages for all species sampled fell in the low contamination category.

In the Central Coast Region, four locations had Gopher rockfish with average concentrations in the “high contamination” category, with the highest levels along the rocky coast between Port San Luis and Morro Bay and north to the Carmel Coast, and lower concentrations in Monterey Bay, Port San Luis, and south.

Likely Causes of Contamination

Fish diet, size, longevity and tissue fat content are important factors influencing the tendencies of some species to accumulate more chemicals in their tissue than others. Fish that eat higher in the food chain (i.e. fish that eat

other fish) are more likely to bioaccumulate mercury, and fish that feed in bottom sediments have a stronger tendency to accumulate some organic chemicals, such as polychlorinated biphenyls (PCBs). Elevated mercury levels in some large, long-lived fish like swordfish, tuna, and shark are well documented. This study shows a tendency towards higher levels of mercury in some species of rockfish, including Gopher, Copper, Black-and-Yellow, and China rockfish. This information may be helpful for people who eat fish.

The natural geology of the Central Coast Region includes some areas with high naturally occurring mercury, including areas with historical mercury mines. Examples of mines (all inactive) include the Oceanic Mine in the Santa Rosa Creek (San Luis Obispo Co.) watershed, the Buena Vista and Klau mines in the Nacimiento River (San Luis Obispo Co.) watershed, and the New Idria mine in the upper watershed of the San Benito River (San Benito Co.). Other sources of mercury can include global emissions to the atmosphere (especially from coal-fired power plants) and upwelling. Upper watershed sediments move downstream and transport mercury and other metals into the nearshore environment, where mixing and longshore transport occur. As a result, some nearshore areas may have higher environmental mercury concentrations than others. Conversely, some high-mercury species may have lower than expected concentrations, depending on where they are caught.

Why do we care and what are we doing?

At sufficient concentrations, exposure to mercury can impair neurological development in fetuses and children and can result in nervous system effects in adults at higher concentrations. Women 18-45 years (who may be pregnant or breastfeeding or could become pregnant) and children up to 17 years in age, in particular, should avoid consumption of fish species that exceed the “no consumption” level in this study. More information on potential mercury impacts on human health is available here:

<http://www.epa.gov/mercury/effects.htm>.

Zone #	Zone of Fish Collection	Blue Rockfish	Black Rockfish	Olive Rockfish	Gopher Rockfish	China Rockfish	Vermillion Rockfish	Copper Rockfish	Rosy Rockfish	Brown Rockfish	Black and Yellow Rockfish	Kelp Rockfish	Cabezon	Kelp Greenling	Lingcod	Barred Sand Bass	Kelp Bass	Chub Mackerel	Rainbow Surperch	Barred Surperch	Black Perch	White Croaker	Bat Ray	Leopard Shark	Pile Surperch	Shiner Surperch	White Surperch	Topsmelt
45	San Mateo Coast																											
43	Santa Cruz Coast Area	10	10		3								4	5	4							5						
42	Santa Cruz Area Wharfs/Beaches				7								5	4	5							5						
41	Elkhorn Slough																							11	9	10	24	
40	Moss Landing/Marina Coast		4		10	5				4	9																	
39	Monterey/Pacific Grove Coast	10	9		5							5								5								
38	Carmel Coast	10		10	5		4						5		5					4								
36/37	Southern Monterey County Coast/Big Sur Coast	10		10			5			5										5								
34/35	Northern San Luis Obispo County/Cayucos north				10		3						5	5							11							
33	Morro Bay																			10			6	9	10	30		
32	Morro Bay Coast			5	10		5		5				5															
31	Diablo Canyon Coast	10			10						5	5								5								
30	Port San Luis Area				10			5		5											8							
28/29	North Santa Barbara County Coast/Pismo Beach Area	5			9		5			5					3													
27	Goleta to Pt Conception	5			5					5						14	4	15										
25	Rincon to Goleta	4		3														18	15			5	15					
26	Santa Barbara Channel Oil Platforms				5					5								6	15				15				10	
23	Northern Channel Islands									5	5							15				8						

Table 1. Central Coast Sampling Zones (north to south), showing species sample count in each zone (the number in each box), and color scoring by species and site. Red indicates at least one species had average mercury tissue concentrations in the “high contamination” category; yellow indicates at least one species sampled fell in the “moderate contamination” category; and green indicates that all species sampled fell in the low contamination category.

The “Total Maximum Daily Load” or “TMDL” is a tool for establishing targets for restoration of waterways to safe concentrations of constituents such as mercury. TMDLs also require reductions in loadings of pollutants to waterways. TMDLs have been developed for mercury in the Sacramento-San Joaquin Delta, San Francisco Bay, and Tomales Bay, and a mercury control program is in development for 74 reservoirs throughout the State. Information on the State Mercury Program can be found here: http://www.waterboards.ca.gov/water_issues/programs/mercury/. Mercury TMDLs have been developed and management practices are being implemented in the Central Coast Region for Clear Creek, Hernandez Reservoir, Las Tablas Creek, and Nacimiento Reservoir. Improvements in mercury concentrations in Clear Creek in recent years have resulted in a finding that it is no longer impaired by mercury. However, because of the geology of the Central Coast and other parts of California, mercury can be found naturally at relatively elevated levels in some areas, including upper watersheds where old mercury mines may not be well stabilized. It is important that consumers consider limiting consumption of some fish species in areas that have been shown to be at risk for mercury accumulation.

OEHHA has released a coastal fish advisory and several site-specific advisories based on the statewide dataset for this study. Because several species of fish showed elevated mercury levels, as well as PCBs in a few species, the coastal advisory was developed for those areas without existing site-specific advice. Readers should refer to the Statewide Advisory for Eating Fish from California Coastal Locations for more information: <http://oehha.ca.gov/advisories/statewide-advisory-eating-fish-california-coastal-locations-without-site-specific-advice>. It recommends that woman between 18 and 45 years of age and all children avoid consumption of Gopher, China, Black-and-Yellow, and Copper rockfish, as well as all sharks, and recommends limited consumption for several other fish species. Separate advice is also provided for men 18 years and older and women 46 years and older. Advisories can be found on the OEHHA website at <http://oehha.ca.gov/fish/advisories>.

References

Davis, J.A., A.R. Melwani, S.N. Bezalel, J.A. Hunt, G. Ichikawa, A. Bonnema, W.A. Heim, D. Crane, S. Swenson, C. Lamerdin, and M. Stephenson. 2010. Contaminants in Fish from California Lakes and Reservoirs, 2007-2008: Summary Report on a Two-Year Screening Survey. A Report of the Surface Water Ambient Monitoring Program (SWAMP). California State Water Resources Control Board, Sacramento, CA. http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/coast_study/bog2012may/coast2012report.pdf

Davis, J.A., J.R.M. Ross, S.N. Bezalel, J.A. Hunt, A.R. Melwani, R.M. Allen, G. Ichikawa, A. Bonnema, W.A. Heim, D. Crane, S. Swenson, C. Lamerdin, M. Stephenson, and K. Schiff. 2012. Contaminants in Fish from the California Coast, 2009-2010: Summary Report on a Two-Year Screening Survey. A Report of the Surface Water Ambient Monitoring Program (SWAMP). California State Water Resources Control Board, Sacramento, CA. http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/lakes_study/lake_survey_yr2_no_app.pdf

OEHHA Fish Advisories. Office of Environmental Health Hazard Assessment.
<http://oehha.ca.gov/advisories/statewide-advisory-eating-fish-california-coastal-locations-without-site-specific-advice>
<http://oehha.ca.gov/advisories/elkhorn-slough>