



MONITORING AND ANALYSIS PLAN

Second Statewide Survey of Bioaccumulation on the California Coast: 2024

Bioaccumulation Monitoring Program

Surface Water Ambient Monitoring Program

Version 1

December 2023



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Background

The Surface Water Ambient Monitoring Program (SWAMP) conducted an initial two-year statewide survey of bioaccumulation on the California coast in 2009-2010 ([Davis et al. 2012](#)). The work was conducted under the guidance of the Bioaccumulation Oversight Group (BOG), a SWAMP subcommittee. The BOG published a sampling and analysis plan for this screening study in 2009 ([BOG 2009](#)).

In 2018, SWAMP and the BOG began a second round of statewide sampling of the California coast. A sampling and analysis plan for this effort was published by the BOG in 2018 ([BOG 2018](#)). The original plan was to conduct this survey over a three-year period (2018-2020). The Southern California Bight was sampled as planned in 2018, in collaboration with the Southern California Bight Program. The results of this monitoring have been published ([McLaughlin et al. 2020, 2021](#)). Due to budgeting issues, contracting issues, and the pandemic of 2020, sampling of the rest of the coast has been spread over more years than originally anticipated. In addition to the Southern California Bight zones, some Central Coast zones were sampled in 2018. In 2019 Humboldt Bay and two zones near Santa Cruz were sampled. In 2020, 12 zones were sampled in the Central and North Coast regions, as documented in the cruise report for that year ([MPSL 2020](#)).

The remaining 18 zones in the Central and North Coast regions will be sampled in 2024. This monitoring and analysis plan documents the plans for completing the second round of coast sampling in 2024.

Monitoring Design Updates

The Safe to Eat Workgroup (STEW; formerly known as the BOG) has provided valuable input and feedback throughout the monitoring process, which has resulted in minor modifications to the monitoring design published in BOG (2018). This update to the original 2018 Monitoring Plan documents the modifications that have been made. All other aspects of the monitoring design match what was outlined in BOG (2018).

The tables and figures that have been updated from the original 2018 Monitoring Plan are provided below, following the numbering used in the original Monitoring Plan. Where changes were minor, revisions to the original tables are highlighted in yellow.

In addition to the updated tables, Figure A is included to provide a map of the 18 zones to be sampled in 2024.

As in the original design, the plan for individual contaminants is as follows.

- Mercury: All samples - individuals in key indicator species, composites for others
- PCBs: Composites of 2 species per zone
- Selenium: Composites of all samples
- Archived samples can be analyzed for other analytes

References

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- MPSL. 2020. Cruise Report for the Surface Water Ambient Monitoring Program (SWAMP) - A Second Statewide Survey of Bioaccumulation on the California Coast (Year 2 of 3 Years). Marine Pollution Studies Laboratory, Moss Landing Marine Laboratories, Moss Landing, CA. <https://drive.google.com/file/d/1hAxmw1kJPWK6OELqbTmUrSmU79XskdZ4/view>

Table 2. Long-term sport fish sampling schedule

At the time of publication of this 2024 sampling plan update, the long-term sampling schedule for the SWAMP Bioaccumulation Monitoring Program is under discussion and to be determined.

Table 6. Target species by region for coastal waters and bays and harbors

Species in italics are those that will be analyzed as individuals for mercury as well as composited for other analytes. If the target species to be analyzed as individuals for mercury are not available, substitutions will be made.

Asterisks (*) indicate species that were in the top five in catch based on RecFIN data for each habitat by region combination.

Bold indicates primary target species for the Bight Program. Based on results of the San Diego Bay Consumption Study, primary targets in San Diego Bay are chub mackerel, spotted sand bass, halibut, and topsmelt.

Entries **highlighted in yellow** are additions to the list based on input from the Department of Public Health, discussed at the STEW meeting on October 18, 2023 (the changes to the list for Southern California are noted for future monitoring in this region).

Coast (>3 miles)

Targe Species Type (Primary or Secondary)	South	Central	North
Primary	<i>Kelp Bass</i>		
Primary	<i>Barred Sand Bass</i>		
Primary	<i>Gopher Rockfish</i>	<i>Gopher Rockfish</i>	<i>Gopher Rockfish</i>
Primary		<i>Brown Rockfish</i>	<i>Brown Rockfish</i>
Primary		<i>Black Rockfish*</i>	<i>Black Rockfish*</i>
Primary		Blue Rockfish*	Blue Rockfish*
Primary	<i>Lingcod</i>	<i>Lingcod*</i>	<i>Lingcod*</i>
Primary		<i>Cabazon</i>	<i>Cabazon</i>
Primary		Salmon	Salmon
Primary	Chub Mackerel*		
Primary	White Croaker	White Croaker	
Primary		Rainbow Surfperch	
Secondary	Scorpionfish		

Target Species Type (Primary or Secondary)	South	Central	North
Secondary	Blue Rockfish		
Secondary	Brown Rockfish		
Secondary	Copper Rockfish	Copper Rockfish	Copper Rockfish
Secondary	Vermilion Rockfish	Vermilion Rockfish	Vermilion Rockfish
Secondary		Olive Rockfish	Olive Rockfish
Secondary		Yellowtail Rockfish*	Yellowtail Rockfish*
Secondary	Barred Surfperch*	Barred Surfperch*	Barred Surfperch*
Secondary	Walleye Surfperch	Walleye Surfperch	Walleye Surfperch
Secondary		Redtail Surfperch	Redtail Surfperch
Secondary	California Halibut	California Halibut	California Halibut
Secondary	Yellowfin Croaker		
Secondary	California Sheephead (OEHHA)		
Secondary	Halfmoon/Opaleye (OEHHA)		
Secondary	Kelp Greenling (OEHHA)		
Secondary	Pacific Halibut (OEHHA)		
Secondary		Jacksmelt*	
Secondary	California Corbina (DPH)		
Secondary	Bocaccio (DPH)		
Secondary		White Seabass	White Seabass
Secondary		Chub Mackerel	Chub Mackerel

Bays and Harbors

Target Species Type (Primary or Secondary)	South	Central	North
Primary	<i>Kelp Bass</i>		
Primary		<i>Brown Rockfish</i>	
Primary	<i>Spotted Sand Bass</i>		

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Target Species Type (Primary or Secondary)	South	Central	North
Primary	Shiner Surfperch	Shiner Surfperch	Shiner Surfperch
Primary			White Surfperch
Primary		<i>Leopard Shark</i>	<i>Leopard Shark</i>
Primary		California Halibut*	California Halibut*
Primary	Jacksmelt*	Jacksmelt*	Jacksmelt*
Primary	White Croaker	White Croaker	White Croaker
Primary	Chub Mackerel*		
Primary		Striped Bass*	
Secondary	<i>Barred Sand Bass</i>		
Secondary	Scorpionfish		
Secondary		Chub Mackerel*	Chub Mackerel*
Secondary		<i>Black Rockfish</i>	<i>Black Rockfish</i>
Secondary	Spotfin Croaker*		
Secondary	Yellowfin Croaker*		
Secondary	White Surfperch		
Secondary		Black Perch	Black Perch
Secondary	California Halibut		
Secondary	<i>Leopard Shark</i>		
Secondary	Gray Smoothound		
Secondary	Brown Smoothound	Brown Smoothound	Brown Smoothound
Secondary	Spiny Dogfish	Spiny Dogfish	Spiny Dogfish
Secondary	Topsmelt		
Secondary		Bat Ray	Bat Ray
Secondary	Halfmoon/Opaleye (OEHHA)		
Secondary			Redtail Surfperch
Secondary			Walleye Surfperch

Table 8. Target species, size ranges, and numbers to include in composites

Items revised from the original 2018 Monitoring Plan are highlighted in yellow. Size range changes are based on guidance published in 2022 by OEHA ([Klasing et al. 2022](#)).

Group	Species	Primary or Secondary Target (P or S)	Mercury in Individuals or Composites (I or C)	# fish in C	Min Legal Size (in)	Min Legal Size (mm)	Median Size 2009-2010* (mm)	Targeted Size Range Individuals (mm)	Size Range Composites (mm)
Rockfish	Kelp Bass	P	I,C	5	14	356	316	3X(156-255) 3X(256-355) 5X(>356)	>356
Rockfish	Barred Sandbass	P,S	I,C	5	14	356	346	3X(156-255) 3X(256-355) 5X(>356)	>356
Rockfish	Spotted Sandbass	P	I,C	5	14	356	327	3X(156-255) 3X(256-355) 5X(>356)	>356
Rockfish	Gopher Rockfish	P	I				281	3X(141-191) 3X(191-241) 5X(>241)	>135
Rockfish	Blue Rockfish	P,S	C	5			293		>200

Group	Species	Primary or Secondary Target (P or S)	Mercury in Individuals or Composites (I or C)	# fish in C	Min Legal Size (in)	Min Legal Size (mm)	Median Size 2009-2010* (mm)	Targeted Size Range Individuals (mm)	Size Range Composites (mm)
Rockfish	Black Rockfish	P,S	I				380	3X(156-255) 3X(256-354) 5X(>355)	>355
Rockfish	Scorpionfish	S	C	5	10	254	290		>254
Rockfish	Olive Rockfish	S	C	5			322		>320
Rockfish	Brown Rockfish	P,S	I				302	3X(150-199) 2X(200-249) 5X(>250)	>250
Rockfish	Copper Rockfish	S	C	5			411		>320
Rockfish	Vermilion Rockfish	S	C	5					>350
Rockfish	Bocaccio	S	C	5					??
Rockfish	Yellowtail Rockfish	S	C	5			313		>290*
Lingcod		P,S	I		22	559	682	3X(359-458) 2X(459-558) 5X(>559)	>559
Croaker	White Croaker	P,S	C	5			220		>150
Croaker	Yellowfin Croaker	S	C	5			195		>167

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Group	Species	Primary or Secondary Target (P or S)	Mercury in Individuals or Composites (I or C)	# fish in C	Min Legal Size (in)	Min Legal Size (mm)	Median Size 2009-2010* (mm)	Targeted Size Range Individuals (mm)	Size Range Composites (mm)
Croaker	Spotfin Croaker	S	C	5			221		>189
Croaker	California Corbina	S	C	5					>250
Croaker	White Seabass	S	C	5					??
Chinook Salmon		P	C		24	Check regs		Not included in 2024	
Surfperch	Barred	S	C	5			186		>160
Surfperch	Redtail	S	C	5	10.5	267	No data		>267
Surfperch	Shiner	P	C	20			110		>100
Surfperch	Walleye	S	C	5			No data		>115
Surfperch	Black	S	C	5			232		>160
Surfperch	Rainbow	P	C	5			280		>125
Surfperch	White	P,S	C	5			202		>125
Smelt	Jacksmelt	P,S	C	5			265		>227
Smelt	Topsmelt	S	C	5			128		>150
Chub Mackerel		P	C	5			240		>260

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Group	Species	Primary or Secondary Target (P or S)	Mercury in Individuals or Composites (I or C)	# fish in C	Min Legal Size (in)	Min Legal Size (mm)	Median Size 2009-2010* (mm)	Targeted Size Range Individuals (mm)	Size Range Composites (mm)
Shark	Leopard Shark	P	I		36	914	1238	3X(914-1074) 4X(1074-1234) 3X(>1234)	>914
Shark	Spiny Dogfish	S	C	3			1011		>867
Shark	Brown Smoothhound	S	C	3			978		>610
Shark	Gray Smoothhound	S	C	3			630		>580
Ray	Bat Ray	S	C	3			405		>347
Halibut	California Halibut	P,S	C	3		559	670		>559
Halibut	Pacific Halibut	S	C	3			No data		??
Cabezon		P,S	I		15	381	467	3X(281-330) 3X(331-380) 5X(>381)	>381
Halfmoon		S	C	5			No data		
Opaleye		S	C	5			221		>189
Kelp Greenling		S	C	5	12	305	360		>309

Group	Species	Primary or Secondary Target (P or S)	Mercury in Individuals or Composites (I or C)	# fish in C	Min Legal Size (in)	Min Legal Size (mm)	Median Size 2009-2010*	Targeted Size Range Individuals (mm)	Size Range Composites (mm)
California Sheephead		S	C	5	12	305	No data		>305
Striped Bass		S	I	3	18	457		3X(257-356) 3X(357-456) 5X(>457)	>457

* based on minimum size caught in the 2009-2010 statewide survey.

Table 10. Parameters to be measured by the SWAMP labs

In the 2018 Plan, 53 PCB congeners were included on the analyte list in Table 10. The number of PCB congeners analyzed has been increasing over the years. In 2024 the full suite of 209 congeners will be analyzed. The sums of PCBs reported will include all 209 congeners, with “not detected” values for individual congeners set to zero. For rigorous comparisons with past data a subset of common congeners can be used.

Figure A. Coastal zones to be sampled in 2024

Sampling Plan for 2024

Station Name

- Crescent City Coast
- Del Norte Coast
- North Humboldt County Coast Area
- Trinidad Area
- Cape Mendocino Area
- Shelter Cove Area
- North Mendocino County Coast Area
- Fort Bragg Area
- Mendocino Coast Area
- Point Arena Area
- South Sonoma Coast/North Sonoma Coast
- Bodega Harbor
- Northern Marin Coast
- Southern Marin Coast
- Farallon Islands
- San Francisco Coast
- Pacifica Coast
- Southern Monterey County Coast

Station Num

- 68
- 67
- 66
- 65
- 64
- 62
- 61
- 60
- 59
- 58
- 57
- 55/56
- 54
- 53
- 51
- 50
- 49
- 48
- 36

