

Cruise Report
2001 Regional Monitoring Program
Summer Water Cruise



July 30-August 3, August 6-8, 2001

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1.0 INTRODUCTION

This report describes activities associated with the second of two water sampling cruises conducted in the year 20001 as part of the Regional Monitoring Program for Trace Substances in the San Francisco Estuary. Water sampling is one component of this program that is designed to provide long-term data on concentrations of trace metals and organic compounds as well as ancillary measurements, suitable for determining trends.

All sampling was conducted from the R/V *David Johnston* except for the two watershed sites that were sampled from shore. Water samples were collected and distributed in the following manner:

- Samples for the analysis of dissolved and total arsenic and selenium were collected from 26 sites by personnel from Dr. Russ Flegal's laboratory at the University of California, Santa Cruz (Flegal) and were sent by Applied Marine Sciences, Inc. personnel (AMS) to Brooks-Rand, Ltd. (BRL) in Seattle, Washington.
- Samples for the analysis of other dissolved and total trace elements (cadmium, cobalt, copper, iron, lead, manganese, nickel, silver, and zinc) and cognates (salinity, dissolved organic carbon, total suspended solids, chlorophyll a, ammonium, nitrate, nitrite, phaeophytin, silicates, and orthophosphate) were collected from 26 sites by Flegal and retained by them at the conclusion of the cruise.
- Samples for the analysis of particulate trace metals (cadmium, cobalt, copper, iron, lead, nickel, silver, and zinc) were collected at six stations by personnel from Flegal and retained by them at the conclusion of the cruise.
- Samples for the analysis of dissolved and particulate trace organics were collected from 18 sites by personnel from Dr. Wally Jarman's laboratory at the University of Utah Energy and Geoscience Institute (Jarman) and retained by them at the conclusion of the cruise.
- Samples for analysis of dissolved and total mercury and monomethyl mercury were collected by Flegal from 26 sites and sent by AMS to the University of Maryland Center for Environmental Sciences (UMCES) at the conclusion of the cruise.
- Samples for intercalibration analysis of dissolved and total mercury and monomethyl mercury were collected from 1 site by Flegal and retained at the conclusion of the cruise.
- Samples for analysis of hardness were collected from 15 sites by Flegal and retained by AMS for delivery to Union Sanitary District in Union City.
- Measurement of surface water salinity, temperature, conductivity, pH, and dissolved oxygen were conducted by Flegal at each site, and the water column at each site was profiled by AMS for

- Samples for analysis of chromium speciation from 10 sites were collected by Flegal and retained by them at conclusion of the cruise.
- Samples for analysis of copper speciation from 6 sites were collected by Flegal and retained by them at the conclusion of the cruise.

2.0 CRUISE REPORT

2.1 Objectives

The objectives of this cruise were to:

1. Collect water samples from 26 sites for analysis of total and dissolved trace elements, and from six sites for particulate trace element analysis.
2. Collect water samples from 26 sites for analysis of ammonia, chlorophyll-a, dissolved organic carbon, nitrate, nitrite, phaeophytin, phosphate, salinity, silicates, and total suspended solids.
3. Collect water samples from 18 sites for analysis of dissolved and particulate trace organics.
4. Collect water samples for analysis of total hardness at 13 sites and any additional sites where salinity is <5ppt.
5. Collect profiles of water-column temperature, conductivity, salinity, dissolved oxygen, and optical back-scatterance at 26 sites.
6. Collect water samples from 26 sites for analysis of total and dissolved arsenic and selenium.
7. Collect water samples for bacterial analysis from 26 sites.
8. Collect water samples for total and dissolved mercury and monomethyl mercury analysis from 26 sites.
9. Collect water samples from five sites for mercury intercalibration.
10. Collect copper speciation samples from six sites.
11. Collect chromium samples from ten sites.

2.2 Personnel

The personnel and work assignments for this cruise were as follows:

Name	Affiliation	Duties
David Bell (7/30)	AMS	Watershed Sampling, Bacteria
Andy Gunther (7/31-8/3)	AMS	Cruise Manager, CTD, Bacteria, Toxicity
Paul Salop (8/6-8/8)	AMS	Cruise Manager, CTD, Bacteria, Toxicity
Sharon Hibdon (7/30-8/3)	UCSC	Trace Metal Chemistry
J. Ostrowski (7/30-8/3, 8/6-8/8)	UCSC	Trace Metal Chemistry
Eric Grabowski (7/30-8/3)	UCSC	Trace Metal Chemistry
Mara Ranville (8/6-8/8)	UCSC	Trace Metal Chemistry
Daniella Rough (8/6-8/8)	UCSC	Trace Metal Chemistry
Genine Scelfo (8/6-8/8)	UCSC	Trace Metal Chemistry
Iris Faraklas (7/30-8/3)	UU	Trace Organics
Ann Baynard (7/30-8/3)	UU	Trace Organics
Theresa Lowe (8/6-8/8)	UU	Trace Organics
Lauren Whatley (8/6-8/8)	UU	Trace Organics
Daniel Oros (8/2)	SFEI	Observer
Rainer Hoenicke (8/6)	SFEI	Observer
Lester McKee (8/8)	SFEI	Observer
Gordon Smith	UCSC	RV <i>David Johnston</i> Skipper

2.3 Sampling Activities

Date	Time	Activity
July 30, 2001	0830-0900	Sampling personnel met at McCarthy Ranch, departed for Standish Dam.
	920-1240	Sampled at Standish Dam (BW10), departed for Guadalupe River site (BW15).
	1410-1615	Sampled at Guadalupe River, departed for Emeryville.
July 31, 2001	0645-0850	Mobilized gear onto the <i>R/V David Johnston</i> at Emeryville Marina, and departed for Oyster Point site (BB30).
	1025-1101	Arrived at Oyster Point and conducted safety briefing. Sampled at

	1325-1459	Sampled at Redwood Creek, departed for Coyote Creek site (BA10).
	1608-1732	Sampled at Coyote Creek, departed for South Bay site (BA20).
	1747-1852	Sampled at South Bay, departed for MARFAC (USGS Marine Facility in Redwood City).
	1956	Arrived at MARFAC, demobilized gear and departed for the motel.
August 1, 2001	0730-0750	Mobilized gear onto the vessel and departed for San Jose site (C-3-0)
	0927-1106	Sampled at San Jose, departed for Sunnyvale site (C-1-3).
	1205-1255	Sampled at Sunnyvale, departed for Dumbarton Bridge site (BA30).
	1402-1605	Sampled at Dumbarton Bridge, departed for MARFAC.
	1647-2006	Arrived at MARFAC. Crew disembarks and shuttles van to Emeryville. Captain Smith (with Ms. Faraklas on board) transits vessel to Emeryville Marina.
August 2, 2001	0800-0816	Mobilized gear onto the vessel at Emeryville Marina, conducted safety briefing, and departed for Golden Gate site (BC20).
	0955-1118	Sampled at Golden Gate, departed for Richardson Bay site (BC30).
	1205-1310	Sampled at Richardson Bay, departed for Red Rock site (BC60).
	1340-1505	Sampled at Red Rock, departed for Point Isabel site (BC41).
	1540-1630	Sampled at Pt. Isabel, departed for Emeryville Marina.
	1700-1730	Arrived at Emeryville Marina, demobilized gear off of the vessel and departed for the motel.
August 3, 2001	0800-0810	Mobilized gear onto the vessel at Emeryville Marina and departed for Alameda site (BB70).
	0855--1028	Sampled at Alameda, departed for Yerba Buena Island site (BC10).

Date	Time	Activity
	1306-1500	Arrived at Emeryville Marina and demobilized gear off of the vessel. Samples for analysis of As, Se shipped to BRL for Saturday delivery. Samples for analysis of Hg and hardness delivered to AMS for temporary cold storage. Samples for analysis of trace elements, bacteria, ancillary measurements, and particulate trace elements delivered by Flegal personnel to UCSC. All remaining samples stored onboard vessel on dry ice.
August 4, 2001	0730-1115	Captain Smith transited the vessel to Benicia Marina.
August 6, 2001	0700-0739	Mobilized gear onto the vessel at Benicia Marina, conducted safety briefing and departed for Davis Point site (BD40).
	0816-1024	Sampled at Davis Point, departed for Pinole Point site (BD30).
	1058-1237	Sampled at Pinole Point, departed for San Pablo Bay site (BD20).
	1308-1515	Sampled at San Pablo Bay, departed for Petaluma River site (BD15).
	1553-1728	Sampled at Petaluma River, departed for Benicia Marina.
	1932-1945	Arrived at Benicia Marina, demobilized gear off of the vessel.
August 7, 2001	0700-0719	Mobilized gear onto the vessel at Benicia Marina and departed for Napa River site (BD50).
	0805-0952	Sampled at Napa River, departed for Benicia Marina.
	1050-1059	Arrived at Benicia Marina, received additional sample containers for Palinek bacteria samples from courier. Departed for Sacramento River site (BG20).
	1307-1440	Sampled at Sacramento River, departed for San Joaquin River site (BG30).
	1516-1713	Sampled at San Joaquin River, departed for Benicia Marina.
	1920-1930	Arrived at Benicia Marina, demobilized gear off of the vessel.
	1930-2130	Mr. Salop delivers toxicity samples to PERL and retrieves dry ice in Concord for sample storage.

Date	Time	Activity
August 8, 2001	0700-0706	Mobilized gear onto the vessel at Benicia Marina and departed for Honker Bay site (BF40).
	0827-0908	Sampled at Honker Bay, departed for Grizzly Bay site (BF20).
	0948-1215	Sampled at Grizzly Bay, departed for Pacheco Creek site (BF10).
	0928–1040	Sampled at Pacheco Creek, departed for Benicia Marina.
	1414-1715	Arrived at Benicia Marina, demobilized gear off of the vessel, delivered toxicity samples to PERL personnel. Mr. Salop delivers samples for analysis of As, Se (BRL), hardness (USD), and Hg, mmHg (UMCES) to FedEx facility in Emeryville for shipment. Samples for analysis of trace elements, bacteria, ancillary measurements, and particulate trace elements delivered by Flegal personnel to UCSC. Samples for analysis of trace organics and particulate trace organics delivered by Jarman personnel to University of Utah.

2.4 Discussion

Sampling was conducted at the locations documented in Table 1. Samples collected from each site are documented in Table 2. Weather conditions during sampling are documented in Table 3.

General Comments

All cruise objectives were accomplished, with the exception of the number of intercalibration samples for mercury and monomethyl mercury. Due to a lack of pre-cleaned containers for use in duplicate and internal calibration samples by UMCES and Flegal, only one intercalibration of both filtered and unfiltered mercury samples was collected.

As was done during previous water cruises, the CTD was left at the surface from shortly after arriving on site, until after the last sample was acquired. At which point the water column was profiled by lowering it to the bottom and then retrieving it at approximately 0.5 meters per second. This was done to allow analysis of changes in surface water conductivity and optical back-scatterance at each site during the duration of water sampling activities.

The time of initiation of the filling of sample containers was documented to allow comparison with concurrent conductivity and optical back-scatterance data collected by the CTD. A database of sample collection times can be found in the file [summer01watercruisetime.pdf](#). Unfortunately, full CTD casts may

were downloaded if not the entire cast from each station. To prevent reoccurrence of this situation, the data collection frequency for the CTD was changed from ten records per second to one record per second, reducing by a factor of ten the amount of data needed to be downloaded between stations.

Two additional analyses were added subsequent to the publication of the cruise plan. These were bacteria analysis for Brian Palenik of UCSD and chromium speciation by Kuria Ndungu of UCSC. The samples were taken at the appropriate stations and delivered to the requesting parties by UCSC personnel.

Table 1. Coordinates of Water Samples Collected

Site Name/Code	Latitude (N)	Longitude (W)	Depth When Sampled (m)	Comments
Standish Dam/BW10	NA	NA	shore	Standish Dam on E bank
Guadalupe\River/BW15	NA	NA	shore	South Bay Yacht Club Dock
Oyster Point/BB30	37° 40.115'	122° 19. 717'	9	50 m W of channel marker "4"
San Bruno Shoal/BB15	37° 36.870'	122° 16. 930'	13	1 nmi NE of channel marker "8"
Redwood Creek/BA40	37° 33.512'	122° 12. 534'	3.5	50 m W of channel marker "12"
Dumbarton Bridge/BA30	37° 30.787'	122° 08. 047'	3	20 m E of channel marker "14"
San Jose/C-3-0	37° 27.612'	121° 58. 546'	2	Just W of railroad bridge in Coyote Creek
Sunnyvale/C-1-3	37° 26.063'	122° 00. 599'	2	Approximately 2.23 nmi up Guadalupe Slough from channel marker "1"
Coyote Creek/BA10	37° 28.114'	122° 03. 775'	6	75 m S of channel marker "18"
South Bay/BA20	37° 29.568'	122° 05. 271'	4	200 m W of channel marker "16"
Golden Gate/BC20	37° 48.007'	122° 38.944'	18	Offshore of Golden Gate
Point Isabel/BC41	37° 53.231'	122° 20. 563'	3	0.61 nmi from Brooks Island and 0.81 nmi from Fleming Point
Red Rock/BC60	37° 55.046'	122° 26. 144'	11	0.7 nmi SW of Red Rock
Richardson Bay/BC30	37° 51.728'	122° 28. 719'	3	30 m NW of channel marker "4"
Alameda/BB70	37° 44.499'	122° 19. 295'	9	20 m SSE of Buoy "A"
Yerba Buena Island/BC10	37° 49.274'	122° 20. 968'	7	0.25 nmi N of Bay Bridge between bridge supports K and L
Davis Point/BD40	38° 03.022'	122° 16. 673'	5	0.2 nmi SW from W end of barge pier
San Pablo Bay/BD20	38° 02.919'	122° 25. 326'	4	100 m S of channel marker "2"
Petaluma River/BD15	38° 06.629'	122° 29. 218'	4	50 m W of channel marker "19"
Pinole Point/BD30	38° 01.479'	122° 21. 740'	5	0.5 nmi from marker off end of pier and 0.7 nmi from channel marker "7"
Honker Bay/BF40	38° 04.013'	121° 56. 045'	2	0.65 nmi N of Simmons Point
Grizzly Bay/BF20	38° 06.949'	122° 02. 355'	1	100 m S of dolphin
Pacheco Creek/BF10	38° 03.069'	122° 05. 890'	10.5	0.2 nmi N of buoy "7"
Napa River/BD50	38° 05.810'	122° 15. 650'	3	50 m off concrete seawall and E of NE corner of Mare Island Naval Shipyard building
Sacramento River/BG20	38° 03.584'	121° 48. 619'	9	0.1 nmi W of channel marker "8"

Table 2. Samples Collected During 2000 Winter Water Cruise

COLLECTION INFORMATION	FILTERED AND UNFILTERED				FILTERED								UNFILTERED			
	As, Se	mmHg Hg	TE	Org.	Nutr.	DOC	Hard.	Sal	Bact	Cu	Cr	Chl.	TSS	Tox.	PM	
Standish Dam/BW10	•	•	•	•	•	•	•	•	•			•	•		•	
Guadalupe River/BW15	•	•	•	•	•	•	•	•	•			•	•		•	
Oyster Point/BB30	•	•	•		•	•		•	•			•	•			
San Bruno Shoal/BB15	•	•	•		•	•		•	•	•	•	•	•			
Redwood Creek/BA40	•	•	•	•	•	•		•	•	•	•	•	•			
South Bay/BA20	•	•	•		•	•	•	•	•			•	•		•	
Coyote Creek/BA10	•	•	•	•	•	•		•	•			•	•			
Dumbarton Bridge/BA30	•	•	•	•	•	•		•	•	•	•	•	•	•		
San Jose/C-3-0	•	•	•	•	•	•	•	•	•		•	•	•	•		
Sunnyvale/C-1-3	•	•	•		•	•	•	•	•			•	•	•		
Golden Gate/BC20	•	•	•	•	•	•		•	•		•	•	•			
Red Rock/BC60	•	•	•	•	•	•		•	•			•	•			
Richardson Bay/BC30	•	•	•		•	•		•	•			•	•			
Point Isabel/BC41	•	•	•		•	•		•	•			•	•			
Alameda/BB70	•	•	•	•	•	•		•	•			•	•			
Yerba Buena Island/BC10	•	•	•	•	•	•		•	•	•	•	•	•		•	
Davis Point/BD40	•	•	•	•	•	•	•	•	•			•	•			
San Pablo Bay/BD20	•	•	•	•	•	•	•	•	•	•	•	•	•		•	
Petaluma River/BD15	•	•	•	•	•	•	•	•	•			•	•			
Pinole Point/BD30	•	•	•	•	•	•	•	•	•			•	•	•		
Napa River/BD50	•	•	•	•	•	•	•	•	•		•	•	•			
Sacramento River/BG20	•	•	•	•	•	•	•	•	•		•	•	•		•	
San Joaquin River/BG30	•	•	•	•	•	•	•	•	•			•	•	•		
Honker Bay/BF40	•	•	•		•	•	•	•	•			•	•			
Pacheco Creek/BF10	•	•	•		•	•	•	•	•			•	•			
Grizzly Bay/BF20	•	•	•	•	•	•	•	•	•	•	•	•	•	•		

• = Sample was collected at this site.

As,Se = arsenic and selenium, mmHg, Hg = monomethyl mercury, total mercury, TE = other trace elements, Org. = organics, Nutr. = nutrients, DOC = dissolved organic carbon, Hard. = hardness, Sal. = salinity, Chl. = chlorophyll, TSS = total suspended solids, Tox. = toxicity, PM = particulate metals, Bact. = bacteria, Cu = copper speciation, Cr = chromium speciation.

Table 3. Weather Conditions During Sampling

Site	Sea State	Tide Stage	Wind Speed (kts)	Wind Dir.	Cloud Cover	Precip.	Comments
Standish Dam/BW10	Calm	Flood	N/A	N/A	100%	none	No sig. rain for months.
Guadalupe River/BW15	Calm	Ebb	N/A	N/A	30%	none	No sig. rain for months.
Oyster Point/BB30	Calm	Flood	2-4	NW	30%	none	No sig. rain for months.
San Bruno Shoal/BB15	1 ft.	Slack	8	NW	0%	none	No sig. rain for months.
Redwood Creek/BA40	Calm	Ebb	8-10	NW	0%	none	No sig. rain for months.
Dumbarton Bridge/BA30	1-2 ft.	Ebb	15	NW	0%	none	No sig. rain for months.
South Bay/BA20	Calm	Flood	10	NW	0%	none	No sig. rain for months.
San Jose/C-3-0	Calm	Flood	2-3	NW	0%	none	No sig. rain for months.
Sunnyvale/C-1-3	Calm	Flood	6	NW	0%	none	No sig. rain for months.
Coyote Creek/BA10	NA	NA	NA	NA	NA	none	No sig. rain for months.
Golden Gate/ BC20	2-3 ft.	Flood	5	W	100%	none	No sig. rain for months.
Richardson Bay/BC30	Calm	Slack	1-2	E	5%	none	No sig. rain for months.
Red Rock/BC60	1 ft.	Flood	8	S	0%	none	No sig. rain for months.
Point Isabel/BC41	1-2 ft.	Ebb	15	SW	0%	none	No sig. rain for months.
Alameda/BB70	1 ft.	Flood	8	W	100%	none	No sig. rain for months.
Yerba Buena Island/BC10	<1 ft	Flood	Calm	Calm	95%	none	No sig. rain for months.
Davis Point/BD40	Calm	Ebb	5	S	0%	none	No sig. rain for months.
San Pablo Bay/BD20	1 ft	Flood	12-15	S	0%	none	No sig. rain for months.
Petaluma River/BD15	1 ft	Slack	12-15	S	0%	none	No sig. rain for months.
Pinole Point/BD30	1 ft	Flood	12-15	S	0%	none	No sig. rain for months.
Napa River/BD50	Calm	Ebb	5	W	100%	none	No sig. rain for months.
Sacramento River/BG20	Calm	Ebb	3	W	0%	none	No sig. rain for months.
San Joaquin River BG30	Calm	Flood	8	W	0%	none	No sig. rain for months.
Honker Bay/BF40	1 ft	Ebb	15	SW	20%	none	No sig. rain for months.
Grizzly Bay/BF20	1-2 ft	Ebb	10-12	SW	5%	none	No sig. rain for months.
Pacheco Creek/BF10	1 ft	Slack	10-12	W	2%	none	No sig. rain for months.