

Cruise Report
1999 Regional Monitoring Program
Sediment Sampling Cruise #19

February 9-12, 16-18, 22-23, 1999

1. INTRODUCTION

This report describes activities associated with the 1999 wet-season sediment sampling cruise of the Regional Monitoring Program (RMP) for Trace Substances in the San Francisco Estuary. Sediment 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 toxicity, throughout the estuary.

Sediment samples were collected and distributed to five laboratories for analysis under RMP protocols. Sample distribution is shown on Table 1.

2. CRUISE REPORT

2.1 Objectives

The objectives of this cruise were:

1. Collect sediment samples at 26 stations for the analysis of:
 - Trace metals and trace organics by Bay Area Dischargers Authority (BADA)
 - As, Hg, Se by Brooks Rand, LTD (BRL)
 - Grain size, TOC and total nitrogen by UC Santa Cruz (UCSC)
 - Pore water pH, ammonia and CTD profiles by Applied Marine Sciences (AMS)
 - Pore water sulfides by Marine Pollution Studies Lab (MPSL)
 - Foraminifera by US Geological Survey (USGS)
2. Collect sediment samples at 14 stations for the analysis of:
 - Toxicity by MPSL
 - Surface Water Interface Cores (SWICs) by MPSL
3. Collect sediment samples at nine stations for the analysis of:
 - Benthic infauna by City and County of San Francisco (CCSF)
4. Collect sediment samples at three stations for the intercalibration analysis of:
 - Trace elements by UCSC
 - Trace organics by Texas A&M University (GERG)
6. Collect sediment splits at one "blind" station for the intercalibration analysis of:
 - Trace elements by UCSC
 - Trace organics by GERG
 - Trace elements and trace organics by BADA

2.2 Personnel

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

<u>Name</u>	<u>Affiliation</u>	<u>Duties</u>
Samir Arora	SFEI	Sample collection
David Bell	AMS	Cruise Manager, sediment chemistry, pH; CTD, watershed sampling
Michael Kellogg (2/12, 2/16-2/17)	CCSF	Benthic sample collection
Nicole Kleinsinger (2/16)	AMS	Sample collection
Paul Salop	AMS	Sample collection, watershed sampling and CTD
Gordon Smith	UCSC	Vessel skipper
Witek Vwpiekarski (2/11, 2/17-2/18)	MPSL	SWIC collection

2.3 Activities

<u>Date</u>	<u>Time</u>	<u>Activity</u>
Day 1 February 9, 1999	1300-1600	Bell and Salop sampled Guadalupe River (BW15). Standish Dam (BW10) station was unable to be sampled due to high flow conditions. All samples stored on ice and brought to AMS same day.
Day 2 February 10, 1999	1500-1900	Demobilized water cruise gear and mobilized sediment cruise gear aboard <i>R/V David Johnston</i> .
Day 3 February 11, 1999	0700-0730	Mobilized remaining gear, conducted safety briefing at Benicia Marina. Departed for Grizzly Bay (BF21).
	0825-0920	Sampled Grizzly Bay, departed for Honker Bay (BF40).
	1000-1040	Sampled Honker Bay, departed for Sacramento River (BG20).
	1130-1315	Sampled Sacramento River, departed for San Joaquin River (BG30).
	1355-1435	Sampled San Joaquin River, departed for Pacheco Creek (BF10).
	1550-1615	Sampled Pacheco Creek, departed for Benicia Marina.
	1700-1745	Arrived at Benicia Marina. M. Kellogg loads benthic infauna sampling gear onto vessel.

Day 4

February 12, 1999 0630-0700 Mobilized gear aboard *R/V David Johnston*, conducted safety briefing at Benicia Marina. Departed for Napa River site (BD50).

0800-0840 Sampled Napa River, departed for Davis Point site (BD41).

0915-1015 Sampled Davis Point, departed for Pinole Point site (BD30).

1040-1130 Sampled Pinole Point. Repair on broken pulley on A frame caused approximate 25-30 minute delay. Departed for Petaluma River site (BD15).

1215-1320 Sampled Petaluma River, departed for San Pablo Bay site (BD20).

1405-1430 Sampled San Pablo Bay, departed for Emeryville Marina.

1730-1900 Arrived at Emeryville Marina, demobilized vessel. All samples for trace elements, organic compounds and intercalibration were transferred to a BADA lab representative. All other chemistry and toxicity samples were kept aboard the vessel on dry ice and wet ice, respectively. The crew was shuttled to Benicia by M. Kellogg to retrieve vehicles.

February 14, 1999 1330-1345 P. Salop checks samples, drains coolers, and replenishes ice as necessary.

Day 5

February 16, 1999 0700-0730 Mobilized gear aboard *R/V David Johnston*, conducted safety briefing at Emeryville Marina. Departed for Point Isabel site (BC41).

0755-0835 Sampled Point Isabel, departed for Red Rock site (BC60).

0910-1130 Sampled Red Rock, departed for Richardson Bay site (BC32).

1215-1245 Sampled Richardson Bay, departed for Horseshoe Bay site (BC21).

1300-1340 Sampled Horseshoe Bay, departed for Yerba Buena Island site (BC11).

1600-1635 Sampled Yerba Buena Island, departed for Emeryville Marina.

1700-1730 Arrived at Emeryville Marina. Demobilized and refueled vessel.

Day 6

February 17, 1999 0700-0730 Mobilized gear aboard *R/V David Johnston*, conducted safety briefing at Emeryville Marina. Departed for Alameda site (BB70).

0820-0920 Sampled Alameda, departed for Oyster Point site (BB30).

0950-1015 Sampled Oyster Point, departed for San Bruno Shoal site (BB15).

1042-1135 Sampled San Bruno Shoal, departed for Redwood Creek site (BA41).

1210-1305 Sampled Redwood Creek, departed for South Bay site (BA20).

1400-1450 Sampled South Bay, departed for Coyote Creek site (BA10).

1510-1550 Sampled Coyote Creek, departed for Dumbarton Bridge site (BD40).

1615-1640 Sampled Dumbarton Bridge, departed for Redwood City USGS dock.

1720-1800 Arrived Redwood City USGS dock, demobilized vessel. Benthic infauna samples removed by CCSF. All other samples stored on ice on the vessel.

Day 7

February 18, 1999 0830-0845 Mobilized gear aboard *R/V David Johnston*, conducted safety briefing at Redwood City. Departed for San Jose site (C-3-0).

1025-1110 Sampled San Jose, departed for Sunnyvale site (C-1-3).

1210-1230 Sampled Sunnyvale, departed for Emeryville Marina.

Arrived Emeryville Marina, demobilized vessel. All remaining samples for trace elements, organic compounds and intercalibration were transferred to a BADA lab representative. Toxicity and pore water samples were taken by W. Vwpiekarski. Foraminifera, cognates, and As, Se, and Hg samples were transferred to AMS

Day 8

February 22, 1999 1100-1400 Salop sampled Standish Dam (BW10). All samples were returned to AMS for distribution.

Day 9

February 23, 1999 0800-1400

Salop transferred pore water samples to Pacific Eco-Risk Laboratories and performed pH and ammonia analysis. The Standish Dam trace elements and trace organics samples were delivered to BADA on 2/23/99. On 2/24/99, AMS shipped all cognates samples to UCSC from AMS, all samples for As, Hg, Se to BRL, and the Standish Dam sulfide sample to MPSL. All foraminifera samples were picked up by USGS 2/25/99.

2.4 Discussion

Sample Collection and Handling Procedures

Prior to sampling, all equipment was thoroughly cleaned. The cleaning process began with a thorough washing with Alconox[®] detergent. The scoops and stirrers were soaked in detergent for two days before washing. Following the detergent wash, the grab and compositing bucket were rinsed with tap water, followed by three rinses with de-ionized water, a rinse with 10% HCl, and a rinse with petroleum ether. The utensils were rinsed three times with de-ionized water, soaked three days with 10% HCl, and rinsed with petroleum ether. Cleaned utensils were sealed in Ziploc[®] bags until used in the field.

Sampling procedures ensured that samples are collected from a localized area at each site to reduce uncontrolled temporal and spatial variation. In the field, the vessel was anchored at the coordinates listed in Table 2. The coordinates were checked throughout sampling to ensure that the anchor had not dragged. Coordinates were recorded for two grabs from each site.

The first sampling operation at each site, where required, was the collection of the benthic samples with the Ponar grab. After the required benthic samples were collected, the Ponar grab was replaced with the Van Veen grab for collection of chemistry samples. After being sieved, benthic samples were preserved in buffered 10% formalin/seawater according to the standard operating procedures used by the City of San Francisco.

When the Van Veen grab was brought on deck, the procedure to be followed for sampling was dependent upon the samples required for each station. At stations requiring toxicity samples, the first acceptable grab was used to collect SWICs; for this process, six 3" cores were placed into the sediment to a depth of 5 cm. After the surface water was drained, the cores were removed sequentially, wrapped in parafilm, capped, then rinsed and labeled.

After SWICs were taken (or at stations not requiring SWICS), the following procedure was followed. After any overlying water was siphoned off, a single scoop was taken from each grab for foraminifera sampling and cores were removed for measurement of pH, ammonia, and total sulfides in pore water. Finally, the remaining top 5-cm of sediment was scooped from each of two replicate grabs and mixed in the bucket to provide a single composite sample for each site for analysis of chemistry, TOC, grainsize, and toxicity. Portions of the composited sample were placed into containers provided by each laboratory. Duplicate chemistry samples were collected from this composite for archival. Cores collected for analysis of pore water were centrifuged onboard the vessel, with 5 ml of supernatant preserved for analysis of sulfides by MPSL. The remainder of the supernatant was to be analyzed on-board for pH and ammonia levels. Electronic problems with the ammonia meter prevented the analysis of pH and ammonia at that time, therefore, 5 ml of

supernatant was collected and stored without preservative in glass containers and remained on wet ice in the dark for the remainder of the cruise.

The quality of grab samples was ensured by requiring each sample to satisfy a set of criteria concerning the depth of penetration and disturbance of the sediment within the grab. Each sample normally contained the top 5-cm of sediment within the area of the grab jaws. Samples were rejected for the following conditions:

- There was a rock or shell fragment wedged between the jaws of the grab allowing the sample to wash out.
- The surface of the sample was significantly disturbed.
- The sample was uneven from side to side, indicating that the grab was tilted when it penetrated the sediment.
- The surface of the sample was in contact with the top doors of the grab, indicating over-penetration of the grab and possible loss of material around the doors.

Samples were collected from each site, composited in the bucket and placed into containers as indicated in Table 3.

Table 1. Sample Distribution List for Sediment Cruise 19, 1999.

Laboratory	Sample Type	# of Sites Sampled
AMS	Pore water sulfides, pH	26
BRL	As, Hg, Se	26
BADA	Trace elements	26
BADA	Organic compounds	26
BADA	Archive	26
		(2 per site)
BADA	Blind intercalibration sample for trace elements and organic compounds	1
CCSF	Benthic infauna	9
GERG	Intercalibration of organic compounds	3
MPSL	Toxicity	14
MPSL	Pore water sulfides	26
MPSL	Surface Water Interface Cores	14
USGS	Foraminifera	26
UCSC	Intercalibration of trace elements	3
UCSC	TOC and grain size	26

Table 2. Coordinates of Regional Monitoring Program Sediment Sampling Sites

Site Name/Code	Latitude	Longitude	Depth (m)	Sediment Description from 2/94
Standish Dam/BW10	37° 27.20'	121° 55.45'	shore	silty sand
Guadalupe River/BW15	-	-	shore	silty sand
San Jose/ C-3-0	37° 27.72'	121° 58.53'	3	approximately 5 cm of coarse sand with shell debris over mud
Sunnyvale/C-1-3	37° 26.13'	122° 00.67'	2.5	soft to semi-soft light brown sediment with some plant debris
South Bay/BA20	37° 29.64'	122° 05.25'	5.5	top 8–10 cm of sediment very soft light brown with Potamocorbula
Coyote Creek/BA10	37° 28.20'	122° 03.80'	5	Shell debris and sandy silt over gray clay
Dumbarton Bridge/BA30	37° 30.87'	122° 08.08'	7	soft brown sediment with shell debris and numerous polychaete tubes near surface over dark gray clayey sediment
Redwood Creek/BA41	37° 33.67'	122° 12.62'	2.5	shell debris near the surface with numerous polychaete tubes over dark gray clayey sediment
San Bruno Shoal/BB15	37° 37.00'	122° 17.00'	12	sandy mud with shell debris over gray clay
Site Name/Code	Latitude	Longitude	Depth (m)	Sediment Description from 2/94
Oyster Point/BB30	37° 40.21'	122° 19.77'	9	soft brown sediment with shell debris and numerous polychaete tubes near the surface over very firm dark gray clay
Alameda/BB70	37° 44.84'	122° 19.40'	10	soft brown sediment with numerous polychaete tubes near the surface over gray clay
Yerba Buena Island/BC11	37° 49.44'	122° 20.93'	6	mixed soft sediment with shell debris over clay
Horseshoe Bay/BC21	37° 49.98'	122° 28.43'	12	very soft light brown sediment with sulfide pockets, over gray clay
Richardson Bay/BC32	37° 51.82'	122° 28.72'	1	soft light brown surficial sediment over firm dark clay
Point Isabel/BC41	37° 53.34'	122° 20.55'	1.5	soft dark brown surficial sediment with dense polychaete tubes over firm, dark clay
Red Rock/BC60	37° 55.00'	122° 25.97'	11	heavy shell debris and coarse sand
Petaluma River/BD15	38° 06.66'	122° 29.00'	4	soft light brown surficial sediment over dark gray mud/clay
San Pablo Bay/BD22	38° 02.86'	122° 25.24'	3	soft light brown surficial sediment over dark gray mud/clay

Site Name/Code	Latitude	Longitude	Depth (m)	Sediment Description from 2/94
Pinole Point/BD30	38° 01.49'	122° 21.71'	6.5	soft light brown surficial sediment over dark gray clay
Davis Point/BD41	38° 03.11'	122° 16.65'	6.5	sandy silt with shell debris
Napa River/BD50	38° 05.79'	122° 15.61'	4	soft light brown silty mud with high density of Potamocorbula
Pacheco Creek/BF10	38° 02.85'	122° 05.66'	4	sandy sediments with layers of soft fine material, with occasional oil droplets
Grizzly Bay/BF21	38° 06.97'	122° 02.35'	3	very soft light brown sediment
Honker Bay/BF40	38° 04.00'	121° 56.00'	3	very soft light brown sediment
Sacramento River/BG20	38° 03.36'	121° 48.63'	8	soft light brown silty sand with high densities of Potamocorbula, over sandier sediments
San Joaquin River/BG30	38° 01.36'	121° 48.44'	5	sandy sediments with plant debris and Corbicula

General Comments

The cruise was not completed as scheduled due to high flow conditions at the Standish Dam (BW10) watershed site that prevented sampling on the scheduled day. The Standish Dam site was successfully sampled on February 22, 1999.

During sample collection at the Red Rock site (BC60), the anchor dragged significantly between successful grabs. The entire sample collected to that point was determined to be suspect. The sample was therefore discarded, the grab and bucket were re-cleaned, and a new sample was collected.

The ammonia meter was producing questionable readings on each day of the cruise, with the exception of Day 1, Guadalupe River sample. The meter failed to maintain calibration from station to station. AMS personnel attempted replacing ammonia probes, changing probe membranes, mixing new standards, and recalibrating without any success. Attempts to obtain a replacement meter for the remainder of the cruise were unsuccessful.

AMS personnel decided to collect supernatant without preservative, and store on ice in the dark for the remainder of the cruise. The samples were processed by AMS at Pacific Eco-Risk Labs on February 23, 1999. The pH readings came out consistently higher and ammonia levels came out consistently lower than expected and relative to samples processed by MPSL on composited sediment. This is thought to have occurred due to the breakdown of ammonia into ammonium that may have occurred in the samples.

It is unknown how long pore water samples may be stored for analysis before breakdown of the ammonia occurs. Therefore, for future cruises, AMS willto ensure porewater analysis can be completed on-board the vessel.

AMS designed and implemented a new sample tracking procedure with this cruise. Per this procedure, each sample collected is given a unique identifying number. Chain of custody forms are now created and printed on board the vessel and accompany samples at all times. Each lab can view copies of all COCs on AMS' web page. Receiving labs were requested to fax copies of COCs directly to SFEI upon their completion. This system will enable each sample to be tracked by its

identifying number at all steps of the process, from collection, to shipment, to processing, to analysis.