

Cruise Report
Regional Monitoring Program
Bivalve Retrieval Cruise #21, Dry Season
September 14-16, 21, 1999

1 INTRODUCTION

This report describes activities associated with the 1999 dry-season bivalve retrieval cruise of the Regional Monitoring Program for Trace Contaminants in the San Francisco Estuary. Bivalves were attached to moorings at 12¹ sites. Measurement of contaminant bioaccumulation in transplanted bivalves during wet-season and dry-season deployments is one component of this program that is designed to provide long-term data on concentrations of trace elements and organic compounds in water, sediments, and tissues, as well as toxicity throughout the Estuary.

Contaminant bioaccumulation in bivalves is being measured in this program by collecting bivalves that are thought to contain low levels of the contaminants measured by the RMP and transplanting them to multiple locations in the Estuary, as well as collecting resident clams from nearby the previously utilized transplantation sites in the Sacramento and San Joaquin Rivers.

During the June '99 deployment, three species of bivalves (*Mytilus californianus*, *Mytilus edulis*, and *Crassostrea gigas* (both diploid and triploid varieties)) were deployed at different locations depending upon the expected range of salinity at the deployment locations. *M. californianus* and *M. edulis* were deployed at all twelve of the sites, while *C. gigas* was deployed only at sites with intermediate salinities; between the Carquinez Strait and San Pablo Bay, and south of the Dumbarton Bridge. *M. californianus* were collected from Bodega Head, *M. edulis* were collected from Tomales Bay, and *C. gigas* were obtained from a commercial grower in Tomales Bay. An additional deployment of *M. californianus* was made at the San Pablo Bay site to test an alternative sample containment system that may not require an intermediate cruise to maintain. Additionally, specimens of *Corbicula fluminea* were collected from the resident populations in areas nearby the historically mooring sites in the Sacramento River and San Joaquin River. Finally, a recording thermosalinograph deployed at the Napa River site was removed for data retrieval and servicing.

2 CRUISE REPORT

2.1 Objectives

The objectives of this cruise were to:

- 1) Retrieve the bivalves deployed during June deployments.
- 2) Examine the bivalve moorings and make note of any needed repairs.
- 3) Retrieve the recording thermosalinograph from the Napa River site.
- 4) Conduct CTD casts at each of the bivalve transplantation sites (not done at the river sites).

¹ Bivalves were not deployed at Grizzly Bay, Sacramento River and San Joaquin River stations.

- 5) Obtain survival data for alternative species, and archive samples of the alternative species for potential future analyses of condition and tissue contaminant residues.
- 6) Retrieve and analyze the new transplantation “cage” deployed at the San Pablo Bay site.
- 7) Divide surviving bivalves into samples for analysis of trace organics and trace elements by the City and County of San Francisco (CCSF), Arsenic and Selenium by Brooks-Rand, Ltd., Arsenic and Selenium intercalibration by CCSF, Trace element intercalibration by UC Santa Cruz, condition by Applied Marine Sciences, and research of immune responses of bivalves by Allison Leungen of UC Santa Cruz.

2.2 Personnel

The personnel and work assignments for this cruise are shown in the following table:

<u>Name</u>	<u>Affiliation</u>	<u>Duties</u>
Jordan Gold	AMS	Cruise Manager, Clam Collections, Diver, Vessel Skipper, Tissue Homogenization
Jay Johnson	AMS	Dive Tender
David Morgan	Romberg Tiburon Center	Vessel Skipper
Paul Salop	AMS	Clam Collections, Dive Master
Ron Walder	AMS	Dive Tender, Diver

2.3 Activities

<u>Date</u>	<u>Time</u>	<u>Activity</u>
9/14/99	0700-0800	Mobilized gear aboard R/V Questuary, Emeryville Marina. Departed for Alameda site (BB71).
	0900-0931	Retrieved bivalves from Alameda, departed for Redwood Creek site (BA40).
	1017-1032	Retrieved bivalves from Redwood Creek, departed for Dumbarton Bridge site (BA30).
	1055-1115	Retrieved bivalves from Dumbarton Bridge, departed for Coyote Creek site (BA10).
	1134-1145	Retrieved bivalves from Coyote Creek, departed for Yerba Buena Island site (BC10).
	1600-1615	Retrieved bivalves from Yerba Buena Island, departed for Emeryville Marina.
	1655-1715	Arrived at Emeryville Marina, demobilized gear off vessel.

<u>Date</u>	<u>Time</u>	<u>Activity</u>
9/15/99	0800-0830	Mobilized gear aboard vessel R/V Questuary, Emeryville Marina. Departed for Horseshoe Bay site (BC21).
	0909-0935	Retrieved bivalves from Horseshoe Bay, departed for Sausalito fuel dock.
	0950-1025	Fueled vessel, departed for Red Rock site (BC60).
	1055-1111	Retrieved bivalves from Red Rock, departed for Pinole Point site (BD30).
	1147-1207	Retrieved bivalves from Pinole Point, departed for San Pablo Bay site (BD20).
	1224-1239	Retrieved bivalves from San Pablo Bay, departed for Petaluma River site (BD15).
	1304-1326	Deployed bivalves at Petaluma River, departed for Emeryville Marina.
	1640-1700	Arrived Emeryville Marina, demobilized vessel.
9/16/99	1205-1240	Mobilized gear and conducted safety briefing on M.E. II at Valejo Marina. Departed for Davis Point site (BD50).
	1253-1324	Retrieved bivalves from Davis Point, departed for Napa River site (BD40).
	1330-1358	Retrieved bivalves and thermosalinograph from Napa River. Departed for Vallejo public boat launch.
	1405-1605	Arrived at Vallejo public launch ramp, demobilized vessel, processed bivalves.
9/21/99	1215-1245	Mobilized gear and conducted safety briefing on M.E. II at Antioch Marina. Departed for San Joaquin River sites.
	1300-1345	Collected clams at San Joaquin River sites, departed for Sacramento River sites.
	1415-1430	Collected clams at Sacramento River site, departed for Antioch marina.
	1500-1540	Arrived at Antioch marina, demobilized vessel, processed bivalves, departed for home.

2.4 Discussion

Site Locations

The coordinates for all bivalve moorings are listed in the following table:

<u>Site Name/Code</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>	<u>Comments</u>
Coyote Creek BA10	37° 28.19'	122° 03.83'	Channel marker "18"
Dumbarton Bridge BA30	37° 30.80'	122° 08.08'	Channel marker "14"
Redwood Creek BA40	37° 32.82'	122° 11.70'	Channel marker "4"
Alameda BB71	37° 41.73'	122° 20.38'	Channel marker "1" 1.65 nmi. SE of Hunters Point
Yerba Buena Island BC10	37° 48.35'	122° 22.25'	Dolphin 0.1 nmi. S of Bay Bridge
Horseshoe Bay BC21	37° 49.87'	122° 28.65'	Dolphin 200 ft W of fishing pier
Red Rock BC60	37° 55.70'	122° 28.13'	Channel marker "2" for Larkspur ferry terminal
Pinole Point BD30	38° 01.00'	122° 22.05'	Channel marker "P"
San Pablo Bay BD20	38° 02.72'	122° 25.71'	Channel marker "1"
Petaluma River BD15	38° 06.77'	122° 30.05'	NE end of railroad bridge
Davis Point BD40	38° 03.26'	122° 15'.63	E side of UNOCAL loading dock
Napa River BD50	38° 04.84'	122° 14.82'	Mare Island Strait adjacent to General Foods facility, 0.7 nmi. from channel marker "2"
Sacramento River BG20	38° 03'.609	121° 47.488'	upstream of Channel marker "8" N of Sherman Island
San Joaquin River BG30	38° 01.256'	121° 47.733'	upstream of Channel marker "8" 0.75 nmi. E of Antioch Marina

Bivalve Species at Each Site

Bivalve species were deployed at each site according to the following table:

<u>Site Name/Code</u>	<u>Date</u>	<u>Number per Species</u>
Coyote Creek/BA10	6/3/99	144 <i>C. gigas</i> 80 triploid <i>C. gigas</i> 160 <i>M. californianus</i> 120 <i>M. edulis</i>
Dumbarton Bridge/BA30	6/3/99	160 <i>M. californianus</i> 80 <i>M. edulis</i>
Redwood Creek/BA40	6/3/99	160 <i>M. californianus</i> 120 <i>M. edulis</i>
Alameda/BB71	6/3/99	160 <i>M. californianus</i> 80 <i>M. edulis</i>
Yerba Buena Island/BC10	6/3/99	72 <i>C. gigas</i> 80 triploid <i>C. gigas</i> 160 <i>M. californianus</i> 120 <i>M. edulis</i>
Horseshoe Bay/BC21	6/4/99	160 <i>M. californianus</i> 120 <i>M. edulis</i>
Red Rock/BC60	6/4/99	160 <i>M. californianus</i> 80 <i>M. edulis</i>
Pinole Point/BD30	6/4/99	120 <i>M. californianus</i> 80 <i>M. edulis</i>
San Pablo Bay/BD20	6/4/99	144 <i>C. gigas</i> 80 <i>M. californianus</i> 80 <i>M. edulis</i>
Petaluma River/BD15	6/4/99	40 <i>M. californianus</i> (in cage) 144 <i>C. gigas</i> 80 <i>M. californianus</i> 80 <i>M. edulis</i>
Davis Point/BD40	6/2/99	144 <i>C. gigas</i> 80 <i>M. californianus</i> 120 <i>M. edulis</i>
Napa River/BD50	6/2/99	144 <i>C. gigas</i> 80 Triploid <i>C. gigas</i> 160 <i>M. californianus</i> 120 <i>M. edulis</i>
Grizzly Bay/BF20	-	No bivalves deployed
Sacramento River/BG20	-	No bivalves deployed
San Joaquin River/BG30	-	No bivalves deployed

Bivalve fate

The fate of all bivalves from this cruise is specified in the table below.

Site Name	Code	Species	# Depl. ¹	#ORG	#TM	#CI	Dead	Other ³	Discard	Missing	Surv %	Comments
Coyote Creek	BA10	CGIG (dip)	142	25	25	25	41	0	27	0	71	
Coyote Creek	BA10	CGIG (trip)	80	25	26	25	3	0	0	0	96	
Coyote Creek	BA10	MCAL	160	30	30	30	19	0	51	0	88	
Coyote Creek	BA10	MEDU	119	30	30	25	17	17	0	0	86	
Dumbarton Bridge	BA30	MCAL	162	40	40	30	1	0	51	0	99	
Dumbarton Bridge	BA30	MEDU	80	0	0	25	5	50	0	0	94	
Redwood Creek	BA40	MCAL	160	40	40	30	8	0	42	0	95	
Redwood Creek	BA40	MEDU	120	27	27	30	6	30	0	0	95	
Alameda	BB71	MCAL	160	35	35	30	7	0	53	0	96	
Alameda	BB71	MEDU	80	0	0	25	8	45	2	0	90	
Yerba Buena Island	BC10	CGIG (dip)	72	0	24	29	18	0	1	0	75	
Yerba Buena Island	BC10	CGIG (trip)	80	0	27	30	23	0	0	0	71	
Yerba Buena Island	BC10	MCAL	160	13	13	0	134	0	0	0	16	heavy predation
Yerba Buena Island	BC10	MED	120	0	0	0	120	0	0	0	0	heavy predation
Horseshoe Bay	BC21	MCAL	157	30	30	27	43	27	0	0	73	
Horseshoe Bay	BC21	MEDU	120	0	0	24	96	0	0	0	20	heavy predation
Red Rock	BC60	MCAL	159	30	30	30	4	40	25	0	97	
Red Rock	BC60	MEDU	80	0	0	29	2	49	0	0	98	
Pinole Point	BD30	MEDU	79	0	0	29	4	46	0	0	95	
Pinole Point	BD30	MCAL	119	30	30	22	7	30	0	0	94	
Pinole Point	BD30	CGIG (dip)	144	36	0	0	108	0	0	0	25	
San Pablo Bay	BD20	CGIG (dip)	145	30	30	30	23	0	32	0	84	
San Pablo Bay	BD20	MCAL	80	0	0	30	3	47	0	0	96	
San Pablo Bay	BD20	MCAL*	40	0	0	30	2	0	8	0	95	*prototype cage
San Pablo Bay	BD20	MEDU	80	0	0	30	3	47	0	0	96	
Petaluma River	BD15	CGIG (dip)	146	30	30	30	27	0	29	0	82	
Petaluma River	BD15	MCAL	78	0	0	18	60	0	0	0	23	
Petaluma River	BD15	MEDU	78	0	0	30	5	43	0	0	94	
Davis Point	BD40	CGIG (dip)	149	25	25	30	53	0	16	0	64	
Davis Point	BD40	MCAL	81	0	23	30	28	0	0	0	65	
Davis Point	BD40	MEDU	119	30	30	30	1	0	28	0	99	
Napa River	BD50	CGIG (dip)	149	30	30	31	26	0	32	0	83	
Napa River	BD50	CGIG (trip)	79	24	23	30	2	0	0	0		
Napa River	BD50	MCAL	160	0	25	30	105	0	0	0	34	
Napa River	BD50	MEDU	119	30	30	30	6	0	23	0	95	
Grizzly Bay	BF20	N/A	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Sacramento River	BG20	N/A	-	2	2	30	N/A	N/A	N/A	N/A	N/A	
San Joaquin River	BG30	N/A	-	2	2	30	N/A	N/A	N/A	N/A	N/A	

¹Bivalves dead upon deployment were subtracted from # deployed

²Clams for chemical analysis allocated by volume, rather than number

³Bivalves to Alison Luengen, UCSC

General Comments

All cruise objectives were achieved. Mr. Gold performed the tissue homogenization at UCSC November 1 – 4. Samples were be distributed to the appropriate laboratories following homogenization.