

# Cruise Report

## 2014 RMP Bivalve Retrieval Cruise

Contract No. 1084

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**Submitted to:**

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## 1. Introduction

This report describes activities associated with the 2014 bivalve retrieval cruise of the Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP). Measurement of contaminant concentrations in transplanted bivalves accumulated during dry season deployment is designed to provide long-term data on the bioaccumulation of trace elements and trace organic compounds in tissue throughout the Estuary.

Contaminant bioaccumulation in transplanted bivalve tissues is measured by collecting bivalves from sites that are known to have low contaminant concentrations and transplanting them to mooring locations in the Estuary. *Mytilus californianus* were collected from Bodega Head on May 16<sup>th</sup>, 2014, and stored in filtered seawater tanks located at the Bodega Marine Laboratory (BML) until their deployment. During this depuration period, BML Aquatic Resources Group (ARG) personnel implemented a cleaning protocol to remove fouling organisms from each mussel to minimize potential for transfer of non-resident species from Bodega coast to San Francisco Bay.

Bivalves were attached to moorings at eight sites on June 10-12, 2014. Bivalves were deployed in three cages at each site, with four compartments holding twenty bivalves in each cage.

One additional set of bivalves was collected as part of this sampling effort:

- Resident *Corbicula fluminea* were harvested nearby to long-term RMP water and sediment sampling locations on the Sacramento and San Joaquin River stations.

## 2. Cruise Report

### 2.1. Objectives

All sampling was conducted from the *RV Questuary*. The objectives of the sampling effort were as follows:

1. Retrieve mussels deployed at seven sites during the deployment cruise (June 10-12, 2014).
2. As available, divide surviving bivalves as follows:
  - 110 bivalves for analysis of trace organics, preparation of homogenate for microcystin analysis, preparation of homogenate for selenium analysis, and collection of an archive by AXYS Analytical (AXYS).
  - 30 bivalves for analysis of growth by AMS
  - 10 bivalves for analysis of siloxanes by Environment Canada.
  - 30 to 40 bivalves for analysis of alternative flame retardants by Southern Illinois University (SIU).
3. Obtain survival data at each transplant site.
4. Harvest resident *Corbicula fluminea* (CFLU) from two sites, historic San Joaquin River and Sacramento River stations.
5. Collect a CTD water column profile at nine sites.

## 2.2. Personnel

The personnel and work assignments for this cruise are shown in Table 1.

**Table 1. Personnel for 2014 RMP Bivalve Retrieval Cruise**

Name	Affiliation	Duties	Contact
Paul Salop	AMS	Cruise manager, diver	salop@amarine.com
Jay Johnson	AMS	Dive tender	johnson@amarine.com
Rebecca Isquith	AMS	Diver (9/16, 9/18), CFLU collections	bemis@amarine.com
Traci Linder	AMS	Diver (9/17), CFLU collections	linder@amarine.com
Amy Franz	SFEI	Sample processing (9/16)	amy@sfei.org
David Morgan	RTC	Vessel Skipper	dmorgan@sfsu.edu

## 2.3. Sampling Activities

Sampling activities for the 2014 RMP Bivalve Cruise are shown in Table 2.

**Table 2. Sampling Activities for 2012 RMP Bivalve Retrieval Cruise**

Date	Time	Activity
Sept 16, 2014	0645-0730	Mobilized gear aboard <i>RV Questuary</i> , San Leandro Marina. Departed for Redwood Creek site (BA40).
	0859-0928	Checked mooring and retrieved bivalves from Redwood Creek site. Departed for Dumbarton site (BA30).
	1000-1020	Checked mooring and retrieved bivalves from Dumbarton site. Departed for Coyote Creek site (BA10).
	1055-1120	Checked mooring and retrieved bivalves from Coyote Creek site. Departed for Emeryville Marina.
	1315-1330	Arrived Emeryville Marina and demobilized vessel. Mr. Johnson retrieved all bivalves and returned them to cold storage at AMS.
Sept 17, 2014	0720-0800	Mobilized gear aboard <i>RV Questuary</i> , Emeryville Marina. Departed for Alameda site (BB71).
	0850-0940	Checked mooring and retrieved bivalves from Alameda site. Departed for YBI site (BC10).
	1025-1056	Checked mooring and retrieved bivalves from YBI site. Departed for Emeryville Marina.
	1120-1215	Arrived Emeryville Marina and demobilized vessel. Mr. Johnson retrieved all bivalves and returned them to cold storage at AMS.
Sept 18, 2014	0920-0944	Mobilized gear aboard <i>RV Questuary</i> , Emeryville Marina. Departed for San Pablo Bay site (BD20).
	1045-1115	Checked mooring and retrieved bivalves from San Pablo Bay site. Departed for Pinole Point site (BD30).
	1143-1210	Checked mooring and retrieved bivalves from Pinole Point site. Departed for Davis Point site (BD40).
	1255-1330	Arrived Vallejo Marina and demobilized vessel. Mr. Johnson retrieved all bivalves and returned them to cold storage at AMS.

Date	Time	Activity
Sept 19, 2014	0701-0750	Mobilized gear aboard <i>RV Questuary</i> , Pittsburg Marina. Departed for Sacramento River site (BG20).
	0810-1049	Collected resident <i>C. fluminea</i> from Sacramento River site. Departed for San Joaquin River (BG30) site.
	1100-1221	Collected resident <i>C. fluminea</i> from San Joaquin River site. Departed for Pittsburg Marina.
	1315-1345	Arrived Pittsburg Marina and demobilized vessel. Ms. Linder retrieved all bivalves and returned them to cold storage at AMS.

## 2.4. Sample Labeling

The sample ID system for all samples was as follows:

RMP-14BC-XXXX

Where:

RMP	=	Project
14	=	Cruise Year
BC	=	Matrix (Bivalve Cruise)
XXXX	=	Unique ID number

## 2.5. Discussion

All cruise objectives were met, with the exception that abundance of live CFLU at target locations was insufficient to support allocation of bivalves for all desired analyses. All CFLU collected were shipped to AXYS for analysis and eventual distribution to laboratories, sufficient mass permitting.

Over the course of deployment, the bivalve cages at site BA10 were covered by three to four feet of sediment, mainly sand and shell hash, causing complete mortality. Bivalves from site BA30 will be analyzed in place of the planned BA10 site.

The number of bivalves allocated for each analysis by site are presented in Table 3. Sample handling protocols are presented in Table 4. Locations of bioaccumulation stations and clam harvesting areas are presented in Table 5.

**Table 3. Number of Bivalves Allocated for Each Analysis by Site.**

Site	Species	# Recovered	# Organics / Microcystin, Org Archive / Se	Archive only	Siloxanes	Flame Retardents	Growth	# Discarded	Survival (%)	Comments
T-0	MCAL	NA	110	NA	10	40	30	NA	NA	
BA10	MCAL	240	NA	NA	NA	NA	NA	NA	0	Full mortality – mooring completely buried
BA30	MCAL	238	110	NA	10	40	30	29	92	
BA40	MCAL	230	110	NA	10	40	30	19	83	Heavy fouling, crab predation
BB71	MCAL	244	110	NA	10	40	30	7	81	Light crab predation
BC10	MCAL	240	85	NA	10	25	27	0	61	Heavy crab predation
BD20	MCAL	240	NA	110	10	40	30	2	80	Heavy crab predation
BD30	MCAL	242	110	NA	10	40	30	38	94	
BG20	CFLU	NA	X	NA	X	X	0	NA	NA	Residents only, possibly insufficient mass to support all analyses
BG30	CFLU	NA	X	NA	X	X	0	NA	NA	Residents only, possibly insufficient mass to support all analyses
T-1	MCAL	30	NA	NA	NA	NA	30	NA	NA	

Notes:

- X – Indicates sample apportioned by volume.
- NA – Not applicable

**Table 4. Sample Handling for 2014 Bioaccumulation Program**

Sample	Container	Handling Requirements
Trace Elements	N/A	Not collected in 2014
Trace Organics	1 gallon zip-top bag	Collect 110 organisms do not rinse, wrap in two layers of aluminum foil, place in zip-top bag, freeze or place on dry ice.
Growth	1 gallon zip-top bag, double-bagged	Collect 30 organisms, rinse with site water, place in zip-top bags, freeze or place on dry ice.
Siloxanes	1/2 gallon zip-top bag (or smaller)	Collect 10 organisms, do not rinse, wrap in two layers of aluminum foil, place in double-bagged zip-top bags, freeze or place on dry ice. Ship on blue ice.
Alternative Flame Retardants	1 gallon zip-top bag	Collect 30 to 40 organisms, do not rinse, wrap in two layers of aluminum foil, place in zip-top bag, freeze or place on dry ice.
Microcystins	N/A	Collected as split from organics homogenate. Sample material forwarded directly from AXYS (coordinated by SFEI).
Selenium	N/A	Collected as split from organics homogenate. Sample material forwarded directly from AXYS (coordinated by SFEI).
Archive	N/A	Collected as split from organics homogenate. Sample material forwarded directly from AXYS.

**Table 5. Coordinates for RMP Bivalve Stations for 2014.**

Site	Lat	Long	Comments
BA10	37.46983	-122.06383	Channel marker "18"
BA30	37.51333	-122.13467	Channel marker "14"
BA40	37.54700	-122.19500	Channel marker "4"
BB71	37.69550	-122.33967	Channel marker "1" 1.65 nmi. SE of Hunters Point
BC10	37.81392	-122.35873	Piles 30m SW of Bay Bridge, center pile in only remaining set of dolphins
BD20	38.05900	-122.42367	Channel marker "4." Approx 1 nmi from channel marker "1" (replaced in 2006)
BD30	38.01667	-122.36750	Channel marker "P"; no ground line – mooring within body length of pile
BG20*	38.05570	-121.80593	Channel marker "8" N of Sherman Island
BG30*	38.02362	-121.80048	Channel marker "8" 0.75 nmi. E of Antioch Marina

Notes

\* Approximate coordinates of dredging run starting point