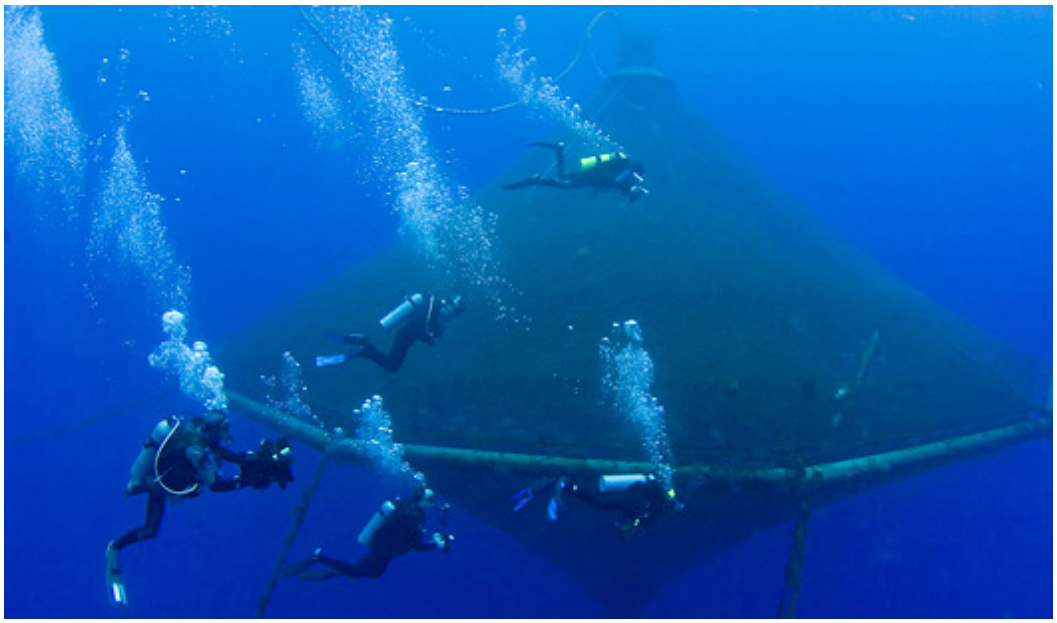
Blue Ocean MARICULTURE

BLUE OCEAN MARICULTURE



11/26/2024

Water Quality Monitoring – Nov. 2024

Prepared by

MEGA Lab
UHH – CNHS
200 W. Kawili St.
Hilo, HI 96720

BLUE OCEAN MARICULTURE

WATER QUALITY MONITORING – NOV. 2024

SAMPLING REPORT

Survey Date: 11/26/2024

Client: Blue Ocean Mariculture

Current: North

Log Number: BOM-WQ-NOV-2024

Environmental Conditions

Effluent samples were collected adjacent to the net pen containing the highest biomass of fish. Sample collection occurred approximately 2-hours after a feeding event at a distance of 3-meters from the pen. The pen was partially raised prior to sampling. The water was clear with no evidence of high turbidity, discoloration, visible sheen, foam, solids, or floating debris near the pen during the sampling event.

Samples were collected during a rising tide (0.6ft to 1.6ft) influenced by a 16% waning moon. Conditions consisted of 10-12kt Northwest winds that stayed relatively consistent throughout the duration of the sampling. A 4-5ft West-Northwest swell was present during sampling and stayed consistent throughout the entire sampling event. Overall, sea conditions were choppy with moderate and variable winds. Skies were clear with light clouds. The East side of the Island had experienced recent thunderstorms. The air had low levels of vog from the Kilauea geological activity. There were several large visible slicks at all sampling stations with low to moderate amounts of particulates observed in the water**.** There were schools of baitfish and ulua observed at the Effluent site.

A strong North current was evident during the time of sampling.

Description of sampling methods

Water samples are collected at the monitoring sites monthly throughout the year. Monitoring sites are at the effluent discharge location near the pen containing the highest biomass of fish, four zone of mixing sites, and two control sites. Effluent samples are collected down current from the net pen containing the highest biomass at the surface, mid-pen, and bottom of the receiving water two hours after feeding. Surface samples are collected no less than 1 meter or more than 5 meters below the surface, and no farther than 10 meters down current from the net pen. Mid-pen samples are collected at the mid-pen depth no farther than one 1 meter down current from the net pen. Bottom samples are collected no less than 1 meter or more than five 5 meters above the sea floor, and no farther than 10 meters down current from the net pen. Zone of Mixing (ZOM) samples are collected down-current from the facility at the boundaries of the ZOM. Samples are collected at the north or south locations depending on the dominant current during the day of sampling. Samples are collected at the surface, mid-pen depth, and bottom of the receiving waters. Surface samples are collected not less than 1 meter or more than 5 meters below the surface. Bottom samples are collected not less than 1 meter nor more than 5 meters above the sea floor.

Water samples collected from the monitoring sites are filtered through pre-combusted (500° C, 6h) GF/F (Whatman) filters (pore size 0.7-µm), as well as directly collected for RAW samples. These water samples are transported to the laboratory on ice and stored at -20°C until analysis. Samples are analyzed for nitrate + nitrite (NO3- + NO2-), ammonium (NH4+), phosphate (PO43-), total dissolved phosphorus (TDP), and total dissolved nitrogen (TDN). The nutrient values are measured using standard autoanalyzer methods. Inorganic nitrogen and phosphorus will be considered indirect measure of terrigenous effluents. Values recorded below the minimum detection limit (MDL) are presented as '<MDL.'. The MDL is calculated with analysis of seven of the same samples (Gravimetric Standard C4, 10, 100, 10, 10 ug/L for NH3, Si, PO4, NO3, and NO2 respectively). These samples are analyzed in order to determine the standard deviation, which is multiplied by the degree of freedom in order to calculate the precise MDL. The gravimetric standards are analyzed throughout the runs to determine calibration drift. Copper values are determined with inductively coupled plasma—mass spectrometry (ICP-MS). Analytical mass and instrumental parameters are selected to ensure accurate and precise determination of copper by using known standards. Turbidity is measured for all samples collected from these locations using a turbidimeter. The turbidimeter is calibrated with known standards prior to analyzing the collected samples to ensure accuracy.

To characterize the conditions at each monitoring station during sampling events, physiochemical parameters (temperature, salinity, conductivity, dissolved oxygen concentration, dissolved oxygen percent saturation, pH) are measured on site using multi-parameter YSI and pH meters. The multi-parameter sonde sensors are calibrated prior to taking measurements using known standards.

LABORATORY TEST RESULTS

			Reported in µg/L				
ID	**DATE**	**LAB ID**	**NO2+ NO3**	**NH3 +NH4**	**PO4**	**TDP**	**TDN**
		MDL	***0.2***	***2.3***	***1.1***	***1.1***	***0.2***
Z1B	11/26/24	31	0.07	<MDL	1.90	3.30	8.30
Z1M	11/26/24	34	0.07	<MDL	<MDL	3.20	8.80
Z1S	11/26/24	35	0.09	6.50	1.10	4.20	9.00
Z2B	11/26/24	36	0.08	<MDL	1.40	3.20	8.90
Z2M	11/26/24	37	0.07	<MDL	<MDL	2.90	8.60
Z2S	11/26/24	38	<MDL	7.10	<MDL	4.10	8.70
Z3B	11/26/24	43	0.06	<MDL	1.30	3.20	8.50
Z3M	11/26/24	44	0.05	<MDL	1.80	3.00	8.30
Z3S	11/26/24	45	0.07	<MDL	<MDL	3.50	7.80
Z4B	11/26/24	46	0.07	<MDL	<MDL	3.40	7.60
Z4M	11/26/24	47	0.09	<MDL	2.10	3.40	8.30
Z4S	11/26/24	50	<MDL	<MDL	2.00	3.50	8.40
EB	11/26/24	59	0.07	<MDL	3.40	3.30	8.90
EM	11/26/24	60	<MDL	<MDL	2.40	3.30	8.90
ES	11/26/24	61	<MDL	<MDL	<MDL	3.10	8.40
C1B	11/26/24	51	<MDL	<MDL	1.60	3.20	8.10
C1M	11/26/24	52	<MDL	<MDL	1.70	3.50	8.70
C1S	11/26/24	53	<MDL	2.80	3.40	3.60	8.80
C2B	11/26/24	54	0.08	<MDL	3.20	3.40	8.60
C2M	11/26/24	57	0.06	<MDL	2.50	3.20	9.20
C2S	11/26/24	58	0.07	5.20	4.10	3.90	8.70

LAB QUALITY CONTROL AND QUALITY ASSURANCE

FASPac II

Run date: 11/27/24
Configuration: BOM Offshore
Run Name: BOM Offshore November 2024

	Position	Identifier	Type	Si µg/l	PO4 µg/l	NO_3 & NO_2 µg/l	Total NH_3 & NH_4 µg/l
22	2:54	GravStd C4	Unknown	94.6	10.3	10.7	10.0
23	2:55	GravStd C4	Unknown	94.3	10.3	10.8	8.6
24	2:56	GravStd C4	Unknown	94.2	9.9	10.7	9.6
27	2:57	GravStd C4	Unknown	93.8	9.5	10.8	9.5
28	2:58	GravStd C4	Unknown	93.6	9.5	10.8	9.8
29	2:59	GravStd C4	Unknown	94.8	10.1	10.8	10.8
30	0.125	GravStd C4	Unknown	92.8	10.1	10.7	10.6
Mean				94.0	10.0	10.8	9.8
std dev				0.679	0.341	0.053	0.735
MDL				2.1	1.1	0.2	2.3
18	SR:19	GravStd C3	Check Cal	243.0	23.1	26.8	25.1
39	SR:19	GravStd C3	Check Cal	245.5	23.6	27.0	24.1
62	SR:19	GravStd C3	Check Cal	246.7	23.1	27.1	26.1
85	SR:19	GravStd C3	Check Cal	255.4	22.5	27.6	25.4
99	SR:19	GravStd C3	Check Cal	-30.1	23.4	27.3	23.9
Mean				192.1	23.1	27.2	24.9
std dev				124.301	0.416	0.305	0.918

MDL Calculations: Analysis of seven of the same samples (Gravimetric Standard C4 10, 100, 10, 10 ug/L for NH3, Si, PO4, NO3 & NO2 respectively), determine Std Dev, multiply Std Dev by degree of freedom (3.14)

Gravimetric standards (different from the calibration standards) are analyzed throughout the run to determine calibration drift.

GRAB SAMPLE RESULTS

Sample ID	Time	Date	Dissolved Oxygen	Dissolved Oxygen	Temperature
Z1B	8:50	11/26/24	6.28	97.22	80.42
Z1M	8:58	11/26/24	6.97	95.12	80.42
Z1S	9:02	11/26/24	6.41	92.62	80.60
Z2B	9:16	11/26/24	6.29	97.86	80.42
Z2M	9:20	11/26/24	6.91	98.64	80.42
Z2S	9:21	11/26/24	6.71	92.99	80.60
Z3B	9:32	11/26/24	6.33	91.93	80.42
Z3M	9:38	11/26/24	6.54	94.14	80.42
Z3S	9:41	11/26/24	6.96	99.14	80.60
Z4B	9:55	11/26/24	6.79	94.95	80.42
Z4M	9:59	11/26/24	6.29	96.62	80.42
Z4S	10:02	11/26/24	6.48	95.91	80.60
EB	10:20	11/26/24	6.45	95.89	80.42
EM	10:26	11/26/24	6.56	92.79	80.42
ES	10:32	11/26/24	6.76	92.95	80.60
C1B	10:44	11/26/24	6.40	92.51	80.42
C1M	10:51	11/26/24	6.40	97.25	80.42
C1S	10:53	11/26/24	6.65	94.62	80.60
C2B	11:01	11/26/24	6.89	98.11	80.42
C2M	11:06	11/26/24	6.32	92.23	80.42
C2S	11:09	11/26/24	6.81	99.22	80.60
Units			mg/mL	% Saturation	Fahrenheit
DL			0.01	0.01	0.01

GRAB SAMPLE RESULTS

Sample ID	Time	Date	pH	Salinity	Turbidity
Z1B	8:50	11/26/24	8.10	35.45	0.07
Z1M	8:58	11/26/24	8.10	35.34	0.07
Z1S	9:02	11/26/24	8.10	35.43	0.09
Z2B	9:16	11/26/24	8.10	35.39	0.08
Z2M	9:20	11/26/24	8.10	35.30	0.07
Z2S	9:21	11/26/24	8.10	35.18	0.10
Z3B	9:32	11/26/24	8.10	35.36	0.06
Z3M	9:38	11/26/24	8.10	35.48	0.05
Z3S	9:41	11/26/24	8.10	35.34	0.07
Z4B	9:55	11/26/24	8.10	35.26	0.07
Z4M	9:59	11/26/24	8.10	35.39	0.09
Z4S	10:02	11/26/24	8.10	35.25	0.11
EB	10:20	11/26/24	8.10	35.35	0.07
EM	10:26	11/26/24	8.10	35.27	0.11
ES	10:32	11/26/24	8.10	35.47	0.10
C1B	10:44	11/26/24	8.10	35.36	0.10
C1M	10:51	11/26/24	8.10	35.27	0.11
C1S	10:53	11/26/24	8.10	35.42	0.11
C2B	11:01	11/26/24	8.10	35.49	0.08
C2M	11:06	11/26/24	8.10	35.24	0.06
C2S	11:09	11/26/24	8.10	35.21	0.07
Units				PPT	NTU
DL			0.01	0.01	0.01

ICP RESULTS

Laboratory Test Results

Description: November 2024, 4 water samples for copper, zinc, and selenium
Job 2279

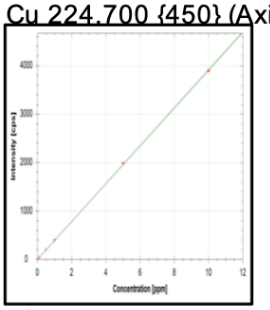
			mg/L		
Site	**Month**	**UHH Lab ID**	**Cu**	**Zn**	**Se**
ES	November	2279-1	ND	ND	ND
ES duplicate	November	2279-1 dup	ND	ND	ND
EM	November	2279-2	ND	ND	ND
EM duplicate	November	2279-2 dup	ND	ND	ND
EB	November	2279-3	ND	ND	ND
EB duplicate	November	2279-3 dup	ND	ND	ND
EC	November	2279-4	ND	ND	ND
EC duplicate	November	2279-4 dup	ND	ND	ND
Method Blank			ND	ND	ND
Detection Limit			**0.001**	**0.01**	**0.01**

Method used: EPA 200.8

ICP QA/QC

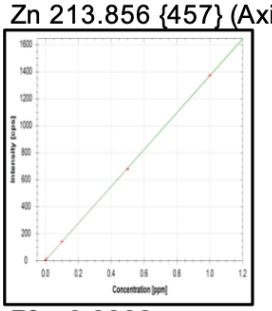
Curves for Job 2279

Cu 224.700 {450} (Axial)



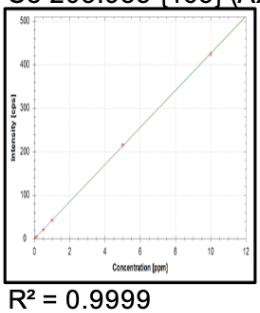
$R^2 = 0.9999$

Zn 213.856 {457} (Axial)



$R^2 = 0.9999$

Se 203.985 {465} (Axial)



$R^2 = 0.9999$

QC utilized 2008CAL-2

Quality control samples

	mg/L		
	Cu	**Zn**	**Se**
Quality Control (QC) Sample	0.10	0.11	0.10
Accepted Range of QC	*0.10 ± 10%*	*0.10 ± 10%*	*0.10 ± 10%*

Please call if you have any questions regarding the water quality monitoring report.

Sincerely,

John Burns, Ph.D.
Associate Professor - Marine Science and Data Science
University of Hawai‘i at Hilo
Affiliate Researcher - NOAA Papahānaumokuākea Marine National Monument
200 W. Kawili St.
Hilo, HI 96720
Lab website: www.themegalab.org/

Natural Energy Laboratory
of Hawaii Authority
Water Quality Laboratory
NELHA

Sample Chain of Custody

73-4460 Queen Kaahumanu Hwy, #101, Kailua-Kona, HI 96740
808-327-9585 http://nelha.hawaii.gov

Client Name:	Blue Ocean Mariculture/MEGA Lab		
Address:	200 W. Kawili St., Hilo HI 96720	Phone:	808-854-4057
		Fax:	
Contact Name:	John Burns	Email:	johnhr@hawaii.edu

Project Information:	Offshore monitoring
Project Location:	Keahole Point
Turn-Around Time:	
Notes:	

Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Test(s) Requested:	Bottle Quantity	Comments / Field Data:
Fishcage, ZOM, Control	11/26/24	8:50	O	JB	Inorganics, totals, turbidity	21	

Relinquished By:	Date/Time	Received By:	Date/Time	Temp °C:	Matrix Key:
J. BURNS	11/26/24 12:55				E = effluent
					GW = groundwater
					O = ocean water
					X= other/unknown

1/1

UHH - 200 W. Kawili St., Hilo HI 96720
Phone • (808) 854-4057

E-mail: johnhr@hawaii.edu

WATER SAMPLE CHAIN OF CUSTODY FORM

Company: Blue Ocean Mariculture Telephone # 808-331-8222 Fax # :

Contact: Tyler Korte Client Project Number: MEGA-WQ-METALS-NOV-2024

Relinquished by: J. Burns Date: 11/26/2024 Time: 16:32

Written Report To: Blue Ocean Mariculture

Project Name: Water Quality Monitoring

Turn-Around (Circle One): Same Day 24 Hour 2 - 5 Day 1 - 4 Weeks Months Rush After Hour Rush

For Laboratory Use Only

Project # MEGA-WQ-METALS-NOV-2024 Method: ICP-METALS

Samples Received by: UHH EPSCoR Analytical Lab Date: 11/26/2024 Time: 16:32

Client Sample Number	Date	Time	Sample Type	Containers	Requested Analyses	Sampled By
EB	11/26/24	10:20	Seawater	250ml	Metals	JB
EM	11/26/24	10:26	↓	↓	↓	↓
ES	11/26/24	10:32	↓	↓	↓	↓

Results Transmitted/Date: Tyler Taylor Fax/Phone By: _____