NSF UNOLS Early Career Training Cruise Report

Cruise ID: KM 24-14
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Eric Pomeroy
Chief Scientist: Angelicque E. White
Technicians: Jeff Koch and Lance Frymire

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1.0 COVID-19 Precautions

Due to the current rise in COVID-19 cases extra precautions were set in place before the cruise to prevent the spread of COVID-19 onboard.

- All cruise participants were Antigen tested for COVID prior to boarding. Vaccination status in no longer monitored.

2.0 Scientific Objectives

The cruise objective was to sample a phytoplankton bloom observed by satellite at a location approximately north of the island of Kauai. This plan superseded a previous plan to sample Station ALOHA due to an incoming tropical storm. Science operations included two drifter arrays (incubation and sediment trap), a free-falling optical profiler (HyperPro), towed camera systems (PICA + VPR), surface net tows, and shipboard incubations. Weather required an early recovery of both arrays; operations were smooth despite heavy seas. **Science operations took place at the following stations**

1) Station 1, referred to as Station Kahe, is at 21° 20.6'N, 158° 16.4'W.

2) Station 2, bloom region, 22.41 °N, 158.565 °W with a six nautical mile radius centered at 22° 45'N,158°W.

3) Station 3, In the lee of Kaena point, approximately 21.55°N, -158.28°W

3.0. Science Personnel

Participant	Title	Affiliation	Citizenship
Angelique White	Professor	UH Manoa	USA
Matthew Church	Professor	U. Montana	USA
Astrid Leitner	Asst. Prof	Oregon State	USA
Xuefeng (Nick) Peng	Asst. Prof	U. South Carolina	CHN
Mariana Bernardi Bif	Asst. Prof	MBARI/UMiami	BRA
Benedict Borer	Asst. Prof	MIT/Rutgers	CH
Noelle Held	Asst. Prof	U. Southern California	USA
Michael Carlson	Asst. Prof	CSU Long Beach	USA
Shiri Graff van Creveld	Postdoc	U. Washington	ISR
Sasha Kramer	Postdoc	MBARI	USA
Nick Baetge	Postdoc	Oregon State	USA
Katelyn Schockman	Postdoc	UMiami/NOAA AOML	USA
Nicole Martin	Postdoc	UH Manoa	USA
Andrew Hirzel	Postdoc	UH Manoa	USA
Lauren Manck	Postdoc	U. Montana	USA
Charles Addey	Grad Student	UH Manoa	NIG
Blake Watkins	Technician	UH Manoa	USA
Sergei Arsenovich Avetisyan	MATE intern	MATE program	USA

4.0. General summary

Equipment loading was conducted on August 21st, and the cruise departed on August 22nd at 0900 (HST) after a brief delay due to needed repairs on the starboard engine and the ships charting system. At Station Kahe, the Hawboldt LARS system passed the prescribed operational checks and weight cast. A CTD cast, Trace Metal rosette cast and PICA were completed before proceeding to the bloom region (a ~ 6hr transit). Upon arrival at the bloom region, a sediment trap was deployed and CTD casts were conducted to prepare for deployment of a free-floating incubation array. The array was deployed pre-dawn without incident. CTD, TM CTD, VPR and PICA operations continued at the bloom station on 8/23 – 8/24. The Hyperpro cast was kept to a single shallow profile (75m) due to large wave swell and wind conditions.

On 8/24 in consultation with the captain and engineer Blake Watkins, the decision was made to prepare for an early recovery of the free-floating arrays as weather was picking up with the approaching tropical storm Hone. Both arrays were recovered on 8/24 without incident; the incubation array was recovered close to dusk to minimize light-contamination of the mesopelagic samples. We then proceeded with a CTD and VPR tow before weather required cessation of operations. We began transit to the lee of Kaena point and Station Kahe to conclude science operations; revision of the schedule and operations were discussed in a 0600 HST science

meeting on 8/25. At Kaena point, a full sequence of hyperpro deployments was conducted along with CTD operations, PICA casts and hand net tows. We transited to the sea buoy for arrival at 0830 HST on 8/26, earlier than the planned 1200 HST arrival. A tug assist was utilized for the ship to dock. Unloading proceeded smoothly.

5.0. R/V *Kilo Moana* Officers and Crew, Technical Support

The R/V *Kilo Moana* experienced issues with the starboard engine and charting systems that were sufficiently resolved to allow for a timely departure on 08/22. The efforts by the UH Marine Center to staff and retain an experienced crew continue made it possible to complete our science schedule despite significant weather. Deck, Engineering and OTG all worked together to keep science operations up and running through challenging weather. Technical support during this cruise was also very good. OTG personnel were particularly helpful in crafting and implementing a successful maiden deployment of the PICA camera system. They also helped with troubleshooting of the system when the deck box became inoperable. A full schedule and event log are below.

	8/22/24	8/23/24	8/24/24	8/25/24	8/26/24
0:00		deploy sediment trap	VPR + night net tow		
1:00		S2C1 TM CTD (300m)		VPR	
2:00					PICA
3:00		S2C2 TM CTD (300m)	PICA		
4:00		S2C3 CTD (500 m)		S2C13 CTD (300m); hyperpro (canceled due to weather)	
5:00		deploy incubation array	S2C8 TM CTD (300m) + net tow	begin transit to Kahe/Kaena Pt due to weather	Transit home (10 hours at 11 knots)
6:00			handheld net tow - port quarter	science meeting	
7:00	All science aboard	Pump tanks and burn trash	Pump tanks and burn trash		
8:00		S2C4 CTD (500 m) CORE	S2C9 CTD (500 m) CORE (+ quick net tow)	transit to Kaena Point due to weather	arrive sea buoy
9:00					arrive honolulu
10:00	Depart transit to shakedown station (Kahe, 21.34N 158.27N)	VPR	VPR	S3C1 CTD (1500 m) Kaena Pt	
11:00					
12:00	Shakedown Station - weight cast (500 m)		PICA (+hand held net tows on port quarter)	S4H1 Hyperpro cast 1	
13:00		PICA			
14:00	Shakedown CTD - S1C1 - (500 m)			S4C1 CTD (1500 m) + net tow	
15:00	Shakedown Trace metal cast - S1-TMC2 (150 m)	S2H1 Hyperpro cast 1	transit to sediment trap/ recover sediment trap	transit to Kahe	
16:00	Shakedown PICA	S2C5 CTD (500 m)	S2C10 CTD (500 m) (+ quick net	PICA at Kahe	

Time					
			tow)		
17:00		Pump tanks and burn trash	transit to incubation array		
18:00	Transit to research area (22.5144; -158.53 ; ~6.5h) - Pump tanks/Incinerator if needed en route	handheld net tow - port quarter	recover incubation array		
19:00		S2C6 CTD (500 m)		handheld net tows	
		handheld net tow - port quarter	S2C11 CTD (500 m) * combo of 11-12	S1C3 CTD (500 m) St. Kahe	
20:00		S2C7 CTD (500 m)		open	
21:00			pumping tanks	open	
22:00		VPR		open	
23:00				open	

Event log

<u>Operations at Kahe (UTC) 8/22/2024</u>
2024-08-22+22:58:34UTC 21.343645 -158.273141 CTD, at surface, 'Weight cast at surface'
2024-08-22+22:59:37UTC 21.343635 -158.273133 CTD, recover, 'Weight cast out of the water'
2024-08-23+00:31:33UTC 21.343624 -158.273138 CTD, deploy, 'S1C01'
2024-08-23+00:31:33UTC 21.343693 -158.273160 CTD, recover, 'S1C01 out of the water'
2024-08-23+01:00:20UTC 21.343665 -158.273164 trace metal, deploy, 'kahe tm cast '
2024-08-23+01:35:06UTC 21.343668 -158.273150 trace metal, recover, '
2024-08-23+02:32:42UTC 21.343618 -158.272236 PICA tow, deploy,
2024-08-23+03:31:26UTC 21.344157 -158.266289 PICA tow, recover, "
<u>Operations in bloom region (UTC) - 8/23/2024</u>
2024-08-23+10:27:49UTC 22.509369 -158.530904 array, deploy, 'Sediment trap begin deploy
2024-08-23+10:49:56UTC 22.509357 -158.530927 array, deploy, 'Sediment trap away'
2024-08-23+11:16:22UTC 22.513097 -158.499879 trace metal, deploy, "
2024-08-23+11:42:22UTC 22.513084 -158.499862 trace metal, recover, "
2024-08-23+13:02:36UTC 22.513140 -158.499882 trace metal, deploy, "
2024-08-23+13:25:34UTC 22.513128 -158.499835 trace metal, recover, 'S2C2 TM on deck '
2024-08-23+14:02:56UTC 22.513130 -158.499860 CTD, deploy, 'S2C03'
2024-08-23+14:29:58UTC 22.513140 -158.499882 CTD, recover, 'S2C03'
2024-08-23+15:25:34UTC 22.513140 -158.500631 incubation array, deploy, "
2024-08-23+18:07:22UTC 22.578417 -158.561338 CTD, deploy, 'S2C4'
2024-08-23+18:41:55UTC 22.578405 -158.561347 CTD, recover, 'S2C4'
2024-08-23+19:11:25UTC 22.588304 -158.563474 VPR, deploy, 'Tow 1'
<u>Operations 8/23 - 8/24 UTC</u>
2024-08-23+22:38:13UTC 22.611979 -158.594310 PICA tow, deploy, "
2024-08-24+00:43:04UTC 22.620902 -158.566819 PICA tow, recover, "
2024-08-24+01:19:34UTC 22.625448 -158.558227 Hyperpro, deploy, 'deep 1'
2024-08-24+01:30:06UTC 22.626323 -158.556461 Hyperpro, recover, 'hyperpro 75m profile end
2024-08-24+02:24:46UTC 22.600158 -158.546035 CTD, deploy, 'S2C05'
2024-08-24+03:19:29UTC 22.588910 -158.546119 CTD, recover, 'S2C5 on deck "
2024-08-24+04:17:34UTC 22.494936 -158.541478 Net tow, deploy, "

2024-08-24+05:00:23UTC 22.478248 -158.534720 CTD, deploy, 'S2C06'
2024-08-24+05:48:27UTC 22.478246 -158.534736 CTD, recover, 'S2C06'
2024-08-24+06:02:18UTC 22.478698 -158.533579 Net tow, deploy, ''
2024-08-24+06:16:38UTC 22.479852 -158.530814 Net tow, recover, ''
2024-08-24+07:10:22UTC 22.468012 -158.542320 CTD, deploy, 'S2C07'
2024-08-24+08:07:32UTC 22.468027 -158.542329 CTD, recover, 'S2C07'
2024-08-24+08:32:52UTC 22.472667 -158.549845 VPR, deploy, 'Tow 2'
2024-08-24+11:53:28UTC 22.488897 -158.664833 VPR, recover, 'Tow 2 recover 2-3 min late'
2024-08-24+12:18:57UTC 22.488922 -158.664794 PICA tow, deploy, 'S2PICA3'
2024-08-24+13:47:34UTC 22.487112 -158.648515 PICA tow, recover, 'S2PICA3'
2024-08-24+15:21:33UTC 22.484727 -158.647880 trace metal, deploy, 's2c08 tm'
2024-08-24+15:58:58UTC 22.484806 -158.646440 trace metal, recover, ''
2024-08-24+16:57:39UTC 22.484801 -158.646394 Net tow, deploy, ''
2024-08-24+18:34:12UTC 22.412100 -158.580454 CTD, deploy, 'S02C09'
2024-08-24+19:23:52UTC 22.412079 -158.580466 CTD, recover, 'S2C09 '
2024-08-24+19:42:39UTC 22.412226 -158.578541 VPR, deploy, 'Tow 3'

Operations 8/24 - 8/25

2024-08-24+21:53:15UTC 22.412451 -158.527422 VPR, recover, 'Tow 3'
2024-08-24+22:08:05UTC 22.412493 -158.527432 PICA tow, deploy, ''
2024-08-24+23:41:23UTC 22.419758 -158.513400 PICA tow, recover, 'S2PICA4'
2024-08-25+01:14:32UTC 22.338873 -158.590825 array, recover, 'Sed trap recovery'
2024-08-25+01:47:29UTC 22.336181 -158.563311 array, recover, 'end sediment trap recovery '
2024-08-25+01:49:51UTC 22.336169 -158.563336 CTD, deploy, 'S2C10'
2024-08-25+02:30:06UTC 22.336200 -158.563358 CTD, recover, 'S2C10'
2024-08-25+04:01:36UTC 22.321390 -158.555967 array, recover, 'incubation array beginning'
2024-08-25+04:36:30UTC 22.320867 -158.553322 array, recover, 'incubation recovery end '
2024-08-25+06:06:54UTC 22.318521 -158.557519 CTD, deploy, 'S2C11'
2024-08-25+06:52:47UTC 22.318538 -158.557541 CTD, recover, 'S2C11'
2024-08-25+10:07:33UTC 22.321004 -158.553800 VPR, deploy, 'Tow 4'
2024-08-25+13:15:20UTC 22.354094 -158.481326 VPR, recover, 'Tow4'

Operations 8/25 - 8/26

2024-08-25+20:34:14UTC	21.524040 -158.474598	CTD, deploy, 'S3C01'
2024-08-25+21:50:26UTC	21.524055 -158.474611	CTD, recover, 'S3C01'
2024-08-25+22:53:57UTC	21.471972 -158.421928	Hyperpro, deploy, 'S4H1'
2024-08-25+23:34:11UTC	21.477927 -158.423241	Hyperpro, recover, '5 yoyo - 2 profile S4H1'
2024-08-25+23:52:39UTC	21.478926 -158.423724	CTD, deploy, 'S4C1'
2024-08-26+01:06:20UTC	21.478841 -158.423794	CTD, recover, 'S4C01'
2024-08-26+01:16:25UTC	21.479096 -158.423778	Net tow, deploy, ''
2024-08-26+03:02:02UTC	21.345375 -158.275044	PICA tow, deploy, ''
2024-08-26+03:10:07UTC	21.345413 -158.274994	PICA tow, transect start, '50m depth with 55m wire out'

2024-08-26+03:26:17UTC with 55m wire out'	21.344842 -158.270824	PICA tow, trasenct end, '50m end
2024-08-26+03:42:08UTC tow 480m wire out'	21.344103 -158.267120	PICA tow, transect start, '475m DSL
2024-08-26+03:57:29UTC 480 m wire out'	21.343718 -158.263861	PICA tow, trasenct end, '475m end
2024-08-26+03:58:56UTC	21.343668 -158.263514	PICA tow, transect start, '500m '
2024-08-26+04:05:18UTC 510m wire out'	21.343643 -158.262631	PICA tow, trasenct end, '500m end
2024-08-26+04:16:15UTC target 200m wire out'	21.343535 -158.260152	PICA tow, transect start, '180m
2024-08-26+04:39:07UTC heave comp ON'	21.343522 -158.254018	PICA tow, trasenct end, '180m end
2024-08-26+04:43:06UTC target start 120m out'	21.343557 -158.252710	PICA tow, transect start, '100m
2024-08-26+04:58:02UTC heave comp off'	21.343537 -158.248993	PICA tow, trasenct end, '100m end
2024-08-26+04:59:40UTC start'	21.343519 -158.248697	PICA tow, transect start, '75m target
2024-08-26+05:14:15UTC only had 70m wire out'	21.343185 -158.245641	PICA tow, trasenct end, '75m end
2024-08-26+05:16:00UTC 40 wire out'	21.343165 -158.245355	PICA tow, transect start, '40m with
2024-08-26+05:30:01UTC	21.343013 -158.242748	PICA tow, trasenct end, '40m end'
2024-08-26+05:35:49UTC	21.343016 -158.242571	PICA tow, recover, 'S1PICA5'
2024-08-26+06:25:26UTC	21.346238 -158.258796	CTD, deploy, 'S1C03 back at Kahe'
2024-08-26+11:25:11UTC	21.344190 -158.273927	PICA tow, deploy, 'S1PICA6 KAHE'
2024-08-26+11:31:30UTC	21.344212 -158.273989	PICA tow, transect start, '55m start'
2024-08-26+11:46:13UTC 60m wire out'	21.344384 -158.271420	PICA tow, trasenct end, '55m end
2024-08-26+11:47:35UTC	21.344369 -158.271120	PICA tow, transect start, '75m start'
2024-08-26+12:03:06UTC 80m wire out'	21.344494 -158.268987	PICA tow, trasenct end, '75m end
2024-08-26+12:04:39UTC	21.344493 -158.268679	PICA tow, transect start, '100m start'
2024-08-26+12:20:40UTC 105m wire out'	21.344632 -158.266547	PICA tow, trasenct end, '100m end
2024-08-26+12:33:51UTC	21.344892 -158.264703	PICA tow, transect start, '450m start'
2024-08-26+12:54:20UTC 460m wire out'	21.345191 -158.259973	PICA tow, transect end, '450m end
2024-08-26+13:05:13UTC	21.345160 -158.257832	PICA tow, transect start, '150m start'

2024-08-26+13:19:33UTC   21.345158 -158.256175   PICA tow, transect end, '150m end 160m wire out'

2024-08-26+13:23:47UTC   21.345020 -158.254956   PICA tow, transect start, '60m start'

2024-08-26+13:34:21UTC   21.344926 -158.253177   PICA tow, trasenct end, '55m transect end 60m wire out'

2024-08-26+13:47:22UTC   21.344792 -158.252360   PICA tow, recover, 'S1PICA6'